



Lawrence Livermore National Laboratory
University of California
Livermore, California 94551

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Lawrence Livermore National Laboratory

Lake Davis Data

Evaluation Project

Author

Tina Carlsen

Contributing Authors

Valerie Dibley
Rebecca Goodrich
Gene Kumamoto
Robert Bainer
Richard Landgraf

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Environmental Protection Department
Environmental Restoration Division

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Executive Summary

This document reports on an evaluation conducted by Lawrence Livermore National Laboratory (LLNL) on chemical analytical and geologic data collected from Lake Davis and vicinity. Lake Davis is a man-made reservoir located in the Plumas National Forest, Plumas County, California. In 1994, the highly predaceous, non-native northern pike was discovered in the lake. As a consequence, the California Department of Fish and Game (CDFG) elected to eradicate all fish from Lake Davis, with subsequent restocking of game trout. The fish eradication was done by treating Lake Davis with formulated Rotenone (a pesticide registered for the eradication of fish) on October 15, 1997. The rotenone formulations included volatile organic compounds (VOCs), semi-volatile organic compounds, and the pesticide synergist piperonyl butoxide (PBO). Local agencies and residents of Plumas County were concerned that the treatment of Lake Davis could adversely effect local ground water supplies. As a consequence, Plumas County contacted LLNL and requested assistance in preparing a statement of work to evaluate any potential threat to ground water supplies. After additional discussions with state and local agencies, LLNL agreed to conduct the following three activities: (1) validate analytical results from water and sediment samples from Lake Davis collected by the California Department of Health Services (CDHS) and analyze by the private analytical laboratory Nevada Environmental Laboratory (NEL), (2) validate analytical results from ground water samples collected by Plumas County and analyze by NEL, and (3) prepare a draft statement of work for inclusion into a request for proposals by Plumas County for an independent review of the existing hydrogeologic evaluation. This work was conducted by LLNL through funds provided for Work in the Public Interest.

On March 3, 1998, prior to the collection of ground water samples by Plumas County, a two-person team of quality control chemists/technologists from LLNL performed an assessment of NEL. The quality assurance procedures in place by NEL were sufficient for the Plumas County project. Between March and July of 1998, LLNL reviewed analytical data from a total of fifty wells located in the vicinity of Lake Davis. Samples collected from these wells were analyzed for VOCs and PBO. LLNL also consulted with Plumas County on the protocol for sampling the wells. Adequate quality control (QC) data was provided by NEL to allow data validation with the exception of the failure to include a copy of the chain-of-custody (CoC) documentation. Therefore, CoC integrity could not be verified. All analytical data were within control limits, and thus acceptable for decision making purposes. Only three wells had positive detections of low levels of VOCs. Two of these wells were located at seasonal residences, and not adequately purged by the sampler prior to sampling. Resampling with adequate purging of one of these wells resulted in no VOCs being detected in the samples. LLNL also collected well water samples collocated with the NEL samples. These samples were analyzed for VOCs by both NEL and a private analytical laboratory subcontracted to LLNL. VOCs were not detected in either set of samples.

Analyses of water and sediment samples collected from Lake Davis were conducted by NEL through a Memorandum of Agreement between CDFG and Plumas County for verification of the CDHS and CDFG results. LLNL reviewed the Memorandum of Agreement (MOA) for Plumas County to ensure adequate analytical methodology and detection limits were included. At the time

the MOA was finalized, low level concentrations of PBO were still being detected in several Lake Davis water locations. Samples were collected and split between NEL and CDHS to allow for inter-laboratory comparison using the actual environmental matrix. NEL data were in control and compared favorably with CDHS data. LLNL also prepared two rounds of performance evaluation (PE) samples to further provide accuracy and precision estimates on NEL. For comparison purposes, the CDHS laboratory also analyzed those PE samples for which they had analytical capabilities. LLNL prepared the water and sediment PE samples for rotenone and PBO in LLNL laboratories, and contracted with Environmental Resource Associates for preparation of the VOC and semi-VOC PE samples. NEL's performance was average. In general, they performed better on the aqueous samples compared to the sediment samples. The data for rotenone in sediment in Round 2 were rejected due to poor laboratory control standard recovery. Water and sediment samples from Lake Davis were collected between May and August 1998. All NEL data were in control with the exception of rotenone/rotenelone in sediment. Due to poor recovery of the laboratory control standard, these data were rejected.

A team of environmental scientists and hydrogeologists from LLNL prepared a draft statement of work for the re-evaluation of the Lake Davis hydrogeology. The draft statement of work was provided to Plumas County on March 20, 1998. LLNL provided to Plumas County a list of possible consultants to which a request for proposals (RFPs) could be directed. A team of LLNL environmental scientists and hydrogeologists evaluated the proposals received by Plumas County against the statement of work, and provided the evaluations to Plumas County. Plumas County selected Leland Gardner and Associates, and work on the re-evaluation began in early July 1998. Leland Gardner and Associates presented the preliminary results of their evaluation and recommendations to representatives of Plumas County, the City of Portola, CDHS and CDFG on September 15, 1998. An LLNL team of environmental scientists and hydrogeologists were also present. Plumas County has requested that LLNL review the final report, which is due in early November 1998.

LLNL also provided assistance in locating a laboratory at the University of California, Davis to conduct tissue analysis of fish captured from Lake Davis both prior and subsequent to restocking the lake with trout. Although this study is still ongoing, Plumas County has requested that LLNL review the results of the tissue analysis.

This report was submitted as a draft document to all members of the Lake Davis Task force and other interested parties on October 19, 1998 (see following distribution page). Comments were requested to be forwarded on November 13, 1998. Verbal comments were received by Leonard Marsh of Restore Lake Davis, Portola, CA, and Plumas County Supervisor Fran Roudebush. Their comments were incorporated into this final document. No written comments were received.

Distribution**Lake Davis Task Force**

Dr. David P. Spath
Chief, Division of Drinking Water and
Environmental Management
California Department of Health Services
601 North 7th Street
MS 216 P. O. Box 942732
Sacramento, CA 94234-7320

Frances J. "Fran" Roudebush
Supervisor, District I
County of Plumas
697 Ridge Street
Portola, CA 96122

Rita Scardaci M.P.H.
Director, Plumas County Health Services
1446 E. Main Street
P.O. Box 3140
Quincy, CA 95971

Bill Crigler, R.E.H.S., M.S.P.H.
Director, Plumas County Department of
Environmental Health
P.O. Box 480
Quincy, CA 95971

Tom Hunter
Public Works Director
County of Plumas
1834 East Main
Quincy, CA 95971

James T. Murphy
City Administrator
City of Portola
35 Third Avenue
P.O. Box 1225
Portola, CA 96122

Bill Powers
Council Member
City of Portola
P.O. Box 1976
Portola, CA 96122

Nick A. Villa
Senior Fishery Biologist
California Department of Fish and Game
1701 Nimbus Road
Rancho Cordova, CA 95670

Leonard Marsh
Restore Lake Davis
P.O. Box 1326
Portola, CA 96122

Jack Thompson
Grizzly Lake Resort Improvement District
Portola, CA 96122

Other Interested Parties

Banky Curtis
Regional Manager
California Department of Fish and Game
1701 Nimbus Road
Rancho Cordova, CA 95670

L. Ryan Broddrick
Chief Deputy Director
California Department of Fish and Game
1416 Ninth Street
Sacramento, CA 95814

Jim Branham
Assistant Secretary for Resources
Resources Agency
1416 Ninth Street
Sacramento, CA 95814

Introduction

Lake Davis is a man-made reservoir located in the Plumas National Forest, Plumas County, California. The California Department of Water Resources (CDWR) operates the reservoir for recreation and to supply domestic water to the city of Portola and the Grizzly Lake Resort Improvement District (CDFG, 1997a). The locations of Lake Davis and Portola are shown in Figure 1. According to the California Department of Fish and Game (CDFG), the highly predaceous, non-native northern pike was found in Lake Davis in 1994 (CDFG, 1997b). CDFG believed the presence of the pike presented a significant threat to California fisheries, particularly to the Sacramento–San Joaquin Delta. As a consequence, the CDFG elected to eradicate all fish from Lake Davis, with subsequent restocking of game trout. The fish eradication was done by treating Lake Davis with formulated Rotenone products on October 15, 1997. Rotenone is a pesticide registered by the U.S. Environmental Protection Agency (EPA) for eradication of fish. Rotenone is a naturally occurring, complex rotenoid, obtained from roots of tropical plants (Extoxnet, 1997). At Lake Davis, two products were used, liquid formulated Nusyn-Noxfish Fish Toxicant, and the powdered Pro-Noxfish Dust Fish Toxicant. Both products contained chemical substances beside Rotenone. Volatile organic compounds (VOCs), including trichloroethylene (TCE), xylene isomers, and naphthalene, and the semi-volatile organic methylnaphthalene isomers, are used to assist in the dispersal of rotenone in aqueous systems. The pesticide synergist piperonyl butoxide (PBO) was also included in the formulation to enhance rotenone fish kill efficacy.

Several state agencies were involved in the Lake Davis eradication project. These include the CDWR and CDFG (both Departments within the Resources Agency of California), as well as the Department of Health Services (CDHS) and the Central Valley Regional Water Quality Control Board (RWQCB). The CDHS was responsible for monitoring the water from Lake Davis and making the determination when the lake was safe to return to providing domestic water. The RWQCB issued a Waste Discharge Requirement to the CDFG for discharges of chemical substances into Lake Davis and Big Grizzly Creek.

Local agencies and residents of Plumas County were concerned that the treatment of Lake Davis, its tributaries and discharge, could adversely effect local ground water supplies. Lawrence Livermore National Laboratory (LLNL) received a letter from Mr. James Stretch, Plumas County Administrative Officer, dated October 24, 1997, requesting assistance in preparing a statement of work to evaluate any potential threat to ground water supplies (Attachment 1). As a result of this request, a team of environmental scientists from LLNL Environmental Restoration Division (ERD) met with representatives of Plumas County, the City of Portola, and CDHS in Portola on December 8, 1997. LLNL learned that although the hydrogeology of the Lake Davis area had been evaluated by the Department of Water Resources (DWR, 1997), local residents remained unconvinced concerning the conclusions made by the CDWR. Concern centered on whether ground water aquifers in the vicinity of Lake Davis were in communication with the lake. Due to LLNL's unique expertise in conducting investigations into the cross-media transport of contaminants to and through ground water, LLNL's ERD agreed to assist the local and state agencies in reevaluating the potential threat the treatment of Lake Davis posed to the area ground water. This work was conducted by LLNL through funds provided for Work in the Public Interest.

LLNL prepared a draft scope of work (SOW) which detailed the activities to be conducted by LLNL to assist the local and state agencies in reevaluating the potential impact to area ground water as a consequence of the treatment of Lake Davis (Attachment 2). The draft SOW was divided into three phases. In Phase 1, LLNL was to prepare a draft statement of work for inclusion into a Plumas County Request for Proposals for a private contractor to review the ground water evaluation conducted by the DWR, as well as to develop a work plan for conducting additional hydrogeologic investigations if any were found necessary. LLNL's involvement consisted of assisting with writing the statement of work and reviewing the private contractors recommendations. Phase II consisted of the private contractor conducting any further hydrogeologic investigation that was identified in Phase I. LLNL's involvement was to conduct a quality control evaluation of the results from any environmental samples collected and analyzed. During Phase III, LLNL was to review the results of the hydrogeologic investigation and make a list of recommendations to be submitted to the state and local agencies.

The draft SOW was FAXed to Plumas County Supervisor Fran Roudebush, who was identified as the local and state agency Point of Contact (POC), on December 22, 1997. Supervisor Roudebush forwarded the SOW to the state agencies of interest. Upon completion of review of the draft SOW by all interested agencies, a conference call was held on January 8, 1998 to discuss the draft SOW. In addition, LLNL received a copy of written comments on the Draft SOW from CDHS through Supervisor Roudebush (Attachment 2). The state agencies indicated that their current priority was procuring an independent analytical laboratory to conduct analyses of lake and sediment samples which were in the process of being collected. LLNL indicated that they could not actually conduct such analyses, but could conduct an independent data validation of the subsequent results. A private analytical laboratory, Nevada Environmental Laboratory (NEL), was discussed, and all agreed this laboratory appeared suitable for conducting the independent analyses. Concern was also expressed by the agencies that the SOW assumed an additional hydrogeologic investigation would be necessary. LLNL assured the agencies this was not intended to be the case, but that an additional hydrogeologic investigation would be conducted only if found to be necessary as a result of the independent review of the existing hydrogeologic evaluation. LLNL acknowledged that both the review of the hydrogeologic evaluation and any subsequent hydrogeologic investigation could potentially be very time consuming and expensive. At the conclusion of the teleconference, LLNL agreed to investigate whether the SOW could be modified to include the data validation of the lake and sediment samples, as well as how to make the SOW more explicit in terms of the phased approach towards the ground water evaluation.

Subsequent telephone conversations between LLNL and Plumas County also identified the need for data validation of ground water samples that were currently being collected in the vicinity of Lake Davis, the cost of which was being born by Plumas County. In addition, it was determined that LLNL could not bear the cost of the analyses of the lake and sediment samples by NEL, but could conduct the data validation. As a result of these telephone conversations, LLNL agreed to modify the draft SOW to contain three components: (1) data validation of the analytical results from lake and sediment samples collected by CDHS and sent to NEL, (2) data validation of the analytical results from ground water samples collected by Plumas County and analyzed by NEL, and (3) preparation of a draft statement of work for inclusion into a RFP by Plumas County for an independent review of the existing hydrogeologic evaluation. Plumas County would then be responsible for obtaining bids to the RFP and locating a funding source for the work. Any involvement by LLNL for reviewing the results of the hydrogeologic review, as well as any

potential follow-on investigation would be subject to available funding. Attachment 3 contains the revised SOW. No written comments were received on this SOW, and thus it became the final SOW outlining LLNL's general involvement with the Lake Davis pike eradication project.

To facilitate communication between all interested parties, a Lake Davis task force was created. The task force was comprised of members from City of Portola agencies, Plumas County agencies, CDHS, CDFG, local community members, and LLNL. The task force met frequently (at times weekly), with many members often participating through teleconference, to discuss the status of sampling and data collection. During the task force meetings, the question was raised whether bioaccumulation of chemicals used during the treatment in any fish (particularly catfish) which may have survived the treatment had been adequately addressed. LLNL agreed to assist in this question, through reviewing available literature, locating a laboratory that could conduct fish tissue analysis, and reviewing any subsequent data.

Well Water Sampling and Data Validation

Because of the time required to prepare an RFP for the re-evaluation of the Lake Davis area hydrogeology as well as to conduct the re-evaluation, Plumas County appropriated funds to conduct sampling and analysis of water supply wells for any resident requesting the service. At the time when the ground water sampling was initiated (February/March of 1998), according to CDHS and CDFG, water samples collected from Lake Davis were detecting only PBO in the tens of $\mu\text{g/L}$ or parts per billion (ppb). As local concern centered around VOCs and PBO, Plumas County wished to collect well water samples to be analyzed for VOCs and PBO. LLNL discussed with Plumas County the difficulty of determining the source of VOCs detected, and that positive detections could not be definitively linked to the treatment of Lake Davis, as sources of VOCs are ubiquitous. Plumas County acknowledged this concern, but determined it was still in their interest to proceed with the VOC analysis.

LLNL also consulted with Plumas County on the protocol for sampling the wells. It was clear from these discussions that two data quality objectives were competing. One objective Plumas County had was to determine what its residents were currently consuming in their well water, and to assure them it is safe. At the same time, however, Plumas County also wished to determine what might be in the aquifer. These two objectives have different sampling protocols. For the first objective, simply turning on the tap to fill the sample vials is sufficient. However, to meet the second objective, careful purging of the well and distribution system is necessary to ensure the water being sampled actually comes from the ground water. Ideally, this would be conducted by calculating the volume of water required to be removed to empty the distribution system and purge the well approximately three casing volumes worth of water. Stabilization of indicator parameters, such as pH and specific conductance would be used to ensure ground water is being collected. Given Plumas County's resources, as well as the difficulty in reaching many of the wells during the winter time when they are covered with snow and non-resident home owners are unavailable, such an elaborate sampling procedure was not feasible. Attachment 4 contains some of LLNL's recommendations for a minimum amount of purging to ensure that at least fresh water was being sampled. Plumas County agreed on the following protocol. For wells in constant use (i.e., resident home owners), sampling was to be conducted as close to the well head as possible, at a

minimum bypassing any filter system. Depending on sampling point, water should be purged long enough to remove stagnant water from the piping prior to sample collection. For wells not in use (non-resident home owners), the well should be purged long enough to remove stagnant water in the well casing. The sampler was to make an effort to determine well depth, pump depth, holding tank size, filter presence, type of residence, and note where the sampling point was and how long the water was purged before sampling.

Plumas County contracted with NEL to conduct the analysis of the ground water samples. NEL worked with CDHS to conduct the method development necessary to conduct the PBO analysis. NEL subcontracted the sample collection to a private sampler. On March 3, 1998, a two-person team of quality control chemists/technologists from LLNL performed a checklist assessment of NEL. The assessment primarily focused on the activities related to the organic drinking water analyses to be performed for Plumas County (EPA Methods 524.2 and 525.2). Indicators of the laboratory's quality assurance program were reviewed such as calibration, logbook documentation and procedures. In addition, other areas of general interest were reviewed including laboratory security, sample receiving and data reduction. Attachment 5 contains the results of the assessment. The quality assurance procedures in place by NEL were sufficient for the Plumas County project. One concern from the assessment was the maintenance of run logs in a three-ring binder. Industry standard is to maintain such logs in a bound logbook to prevent post-modification. Although not suggesting NEL had conducted such an activity, other laboratories have been caught post-modifying dates to make it appear that samples that had missed holding times were analyzed within holding time. A simple change to taping the run logs into a log book with the signature of the Quality Assurance (QA) manager over the tape would prevent any such concerns. This suggestion was verbally provided the NEL's QA manager.

On March 4, 1998, the same QC team from LLNL accompanied NEL's subcontracted sampler on the first day of well water sampling. NEL collected samples for VOCs (EPA Method 524.2) and PBO analysis. CDHS was also present, and collected samples for rotenone and rotenone (a break-down product of rotenone). Five samples were collected by LLNL concurrently with NEL. LLNL observed the NEL sampler's technique and sampling procedures. The samples were collected in a manner to ensure the samples were representative of the well water being measured. An attempt was made at each site to purge one well volume so that fresh water could be collected. The samples were labeled at the sampling location, a CoC was properly used, no headspace was allowed in the samples, and the samples were preserved (cooled) in an ice chest.

LLNL also collected well water samples collocated with the NEL samples. At the beginning of the project, it was hoped that such collocated samples would be analyzed at LLNL subcontracted analytical laboratories for rotenone, PBO and VOCs. However, due to the very small number of samples, the LLNL subcontracted laboratories did not find it economically justifiable to develop methods for these analyses. Therefore, the LLNL collocated samples were analyzed for VOCs only using EPA Method 524. Table 1 shows the results of the collocated samples. As can be seen, VOCs were not detected in either set of samples. While such data suggest good precision on the VOC analyses, it is not as definitive as when detectable concentrations are compared between laboratories.

Well water sampling continued from March 4 through June 29, 1998. Sampling was conducted over such a long period of time due to access difficulties caused by particularly severe weather, as well as from difficulties contacting seasonal residents. Attachment 4 contains a copy

of the subcontracted samplers' notes. Table 2 summarizes the results of the LLNL data validation. LLNL reviewed analytical data from a total of fifty wells. Adequate QC data was provided by NEL to allow a data validation with the exception of the failure to include a copy of the CoC documentation. Therefore, chain-of-custody integrity could not be verified. All analytical data were within control limits, and thus acceptable for decision making purposes. Three sampling locations had positive detections of low levels of VOCs (9090 Marilyn Dr., 7322 Marilyn Dr., and 2327 Old Grizzly). The wells at the two locations on Marilyn Drive were probably not adequately purged by the sampler prior to sampling. Although LLNL was told by Plumas County that both wells were to be resampled, LLNL received resampling data for only 7322 Marilyn. This was the only location that detected chemicals that were also used in the lake treatment (in this case, xylene). In addition, many unidentified peaks were observed by the NEL chemist in the analysis used for PBO. This suggested the well sample had a large quantity of organic compounds. However, this was a well at a seasonal location, which was purged for only a few minutes, the sampler noted the water to be brown and bubbly. After adequate purging, no VOCs were detected, and no unidentifiable peaks were observed in the PBO analysis. Thus, these results were probably due to material in the well system accumulating during the period of no use, which were not adequately removed prior to sampling.

Validation of Water and Sediment Samples from Lake Davis

In order to demonstrate the absence of chemicals used in the treatment of Lake Davis in the lake, CDHS and CDFG agreed to conduct sampling of water and sediment from ten locations in Lake Davis and analyze these samples for rotenone, rotenelone, the VOCs TCE, naphthalene and xylene isomers, and the semi-VOCs 1-methylnaphthalene and 2-methylnaphthalene. Figure 2 shows the sampling locations. Water column samples were taken from three depths, one near the surface, one mid-way in the water column, and one near the base of the water column. Actual depths of these samples varied with sampling location. In order to demonstrate the lake to be free of chemicals, three separate sampling events with non-detectable analytical results were required. Because of community concern surrounding the collection and analysis of the water and sediment samples by CDFG and CDHS, Plumas County requested that the third and final set of samples also be analyzed by a laboratory independent of CDFG and CDHS.

NEL was again selected by Plumas County to conduct these analysis. Plumas County agreed with CDFG that they (Plumas County) would be the entity contracting with NEL, with the expectation that they would be reimbursed by CDFG. They agreed to prepare a Memorandum of Agreement (MOA) between CDFG and Plumas County outlining the work expected to be conducted at NEL. LLNL was asked to review the MOA to ensure adequate analytical methodology and detection limits were included. Attachment 6 contains a letter from Plumas County to CDFG which combined comments from both Plumas County and LLNL. The biggest point of discussion revolved around the VOC sediment methodology. LLNL had recommended a newer extraction method (EPA Method 5035) to be used with the analytical method (EPA Method 8260). EPA Method 5035 involved transferring the sediment into the analytical purging vial in the field, thus eliminating one sample transfer and thereby reducing the potential for volatile loss. NEL had the equipment to conduct such analyses, but had just recently finished the method

development, and had limited experience with field samples. CDFG had concerns over both heterogeneity in selecting the portion of sample to be transferred into the vial, as well as the relative lack of experience by NEL compared to the existing method. While LLNL did not find the heterogeneity argument compelling (a similar process is done in the lab to transfer a subsample into the purge vessel), LLNL agreed the lack of experience with the new method to be a concern. In addition, the State of California Environmental Protection Agency continued to recommend the existing method. Therefore, LLNL agreed to the use of the existing soil sample extraction method (EPA Method 5030 headspace) for VOCs.

As the MOA for analytical services on lake water and sediment samples was finalized, low level concentrations of PBO were still being detected in several Lake Davis water locations. At LLNL's request, CDHS collected collocated samples to be split between NEL and CDHS to allow for inter-laboratory comparison using the actual matrix. Table 3 shows the results of these analyses. Data from the CDHS laboratory was provided by CDHS and was not reviewed by LLNL. NEL data were in control, and compared favorably with CDHS data.

LLNL prepared two rounds of performance evaluation (PE) samples to further provide accuracy and precision estimates on NEL. Round 1 samples were to be analyzed prior to the third and final verification sampling of Lake Davis, while Round 2 was to be analyzed at the time of the final verification sampling. LLNL prepared the water and sediment PE samples for rotenone and PBO in LLNL laboratories, and contracted with Environmental Resource Associates (ERA) for preparation of the VOC and semi-VOC PE samples. NEL was expected to analyze both water and sediment samples for all chemicals of concern. CDHS was not expected to conduct the VOC or semi-VOC sediment analyses, nor the methylnaphthalene analyses, as they did not have these analytical capabilities. Attachment 7 contains memos from LLNL to NEL and CDHS outlining the analytical expectations for both PE rounds. Round 1 was initiated on May 28 and Round 2 on June 9. Samples from LLNL were shipped to the laboratories for Round 1 and hand-carried to the lake sampling site for Round 2. Expected concentrations in LLNL samples were determined through theoretical calculation only. The initial set of Round 1 samples from LLNL arrived at both CDHS and NEL broken, and thus were prepared a second time. These samples were hand-delivered to CDHS and specially packaged for shipment to NEL. This second set of samples in Round 1 from LLNL arrived at both laboratories in good condition.

Samples from ERA were shipped directly to the laboratories. Certifications for the ERA PE samples can be found in Attachment 7. These certifications include ERA's Performance Acceptance Limits (PALs). PALs are listed as guidelines for acceptable analytical results given the limitations of the USEPA methodologies commonly used to determine these parameters and closely approximate the 95% confidence interval. ERA's PALs are based on analytical verification data generated by ERA, independent referee laboratory results and data from various inter-laboratory studies. If the analytical result falls outside the PAL, ERA recommends that an investigation be initiated into potential sources of error. Naphthalene and the methylnaphthalenes in many cases did not have a PAL, indicating these constituents are not frequently analyzed in the particular method being specified, and thus sufficient data were not available to determine PALs. Thus, the range of laboratory accuracy for these analytes would be expected to be large, due to relative inexperience with these substances.

Table 4a summarizes the analytical results of the PE samples, and Table 4b presents the analyses of the PE sample data. NEL's performance was average. NELs results were within

ERA's suggested PALs for those substances in which PALs were available. In general, they performed better on the aqueous samples compared to the sediment samples. This is typical of the industry, as sediment analyses can be difficult. The sediment sample results for rotenone, PBO and the methylnaphthalenes were consistently low. In one case, the data for rotenone in sediment in Round 2 should have been rejected due to poor laboratory control standard recovery. NEL's VOC sediment data were much better, although they failed to detect the naphthalene. In addition, the holding time was missed on these samples. NEL has greater experience with VOCs, so the improvement in the sediment results is not surprising. NEL did have some difficulty with properly identifying the samples in the analytical report, and in one case (PBO results in water in Round 1) an error is suspected in the reported concentration. Several attempts to have NEL review the summary of the PE results failed to get a response from NEL.

Although the PE samples were intended to evaluate NEL, the CDHS laboratory was included for comparison. CDHS did not provide QC data with the analytical results, so full data validation could not be conducted. CDHS indicated they do conduct the necessary QC, and it is available for review in their laboratory. Based solely on accuracy (Table 4b), the CDHS lab produced superior results to NEL for those data reported. Neither NEL or CDHS reported all expected analytical data. In Round 1, CDHS reported 100% of the expected results, with NEL reporting 81%. These percentages dropped in Round 2 to 78% and 73% for CDHS and NEL, respectively. These are exceedingly poor completeness percentages. For example, the completeness objective for analytical data collected for LLNL's Environmental Restoration Division (ERD) is 90% (Carlsen et al., 1992). NEL and CDHS accuracy is also presented in Table 4b, again showing NEL to be adequate for some constituents, and marginal in others. CDHS consistently shows good accuracy. ERD accuracy objectives typically range from ± 5 to 25%, depending on the compound (Carlsen et al., 1992). New accuracy objectives currently being developed are broader for soil analyses, reflecting the inherent difficulty with these analyses. The relative percent difference (RPD) between the results from CDHS and NEL was adequate for most cases, the exception was those RPDs for PBO and naphthalene in water in Round 1. The large RPDs in these cases were due to NEL's poor accuracy on these two samples. ERD objectives for inter-laboratory RPDs are as high as 45%, reflecting the fact that acceptable accuracy objectives of $\pm 25\%$ can result in a large RPD if one lab's accuracy is +25% and the second lab's accuracy is -25%. In several cases, CDHS provided duplicate data, allowing the calculation of precision for these samples. CDHS showed excellent internal precision.

Table 5 summarized the results of the LLNL data validation of the results of lake and sediment samples analyzed by NEL. The sediment samples collected on May 12 and May 27 were a part of the effort by CDFG to obtain two sets of samples with non-detectable concentrations prior to the final verification sampling. Miscommunication to NEL by CDFG resulted in the May 12 samples being analyzed using an incorrect method resulting in unacceptably high detection limits. Fortunately, this was caught within the holding time of the samples, and they were re-analyzed using the correct method. The sampling event on June 12 was to be the final verification sampling. All NEL data were in control with the exception of rotenone/rotenelone in sediment. Due to poor recovery of the laboratory control standard, these data were rejected. In addition, PBO was again detected at location 2 by NEL just above the detection limit of 2 $\mu\text{g/L}$. According to the CDHS, it was also detected by the CDFG laboratory just below the detection limit. Although the NEL data for rotenone/rotenelone in sediment were inconclusive, according to CDHS, neither CDHS or CDFG laboratories detected these substances in their samples. Therefore, it was decided that there

was sufficient weight-of-evidence indicating Lake Davis sediment to be free of these substances. Although LLNL did not review these data, LLNL agreed that if the analytical data were as stated, they did substantiate the claim the sediments were free of these constituents. Thus, additional verification sampling on sediment was not required.

Because of the PBO detection, sampling of location 2 continued. By late July, two subsequent samples were again non-detectable for PBO. On August 4, 1998 all ten locations at the shallowest and deepest depths were sampled, and the samples analyzed for PBO. QC data for these samples were in control, and all samples were free of PBO at the detection limit of 2 µg/L.

CDHS held a public meeting on September 14 in Portola to inform the residents that CDHS had approved the water from Lake Davis for use as a drinking water supply. LLNL attended the meeting. It was left to the discretion of the City of Portola and Plumas County to determine when they wished to return to using the lake water. CDHS will be periodically monitoring the lake water for the chemicals used in the treatment at a frequency yet to be determined. This was deemed to be a prudent measure, which will allow monitoring of the water column through several cycles of lake turn over.

Ground Water Re-evaluation Statement of Work

Many of the private residences in the vicinity of Lake Davis obtain their water supply from private wells. The treatment of Lake Davis with chemicals to kill the predatory pike raised concerns among many residents about the potential for these chemicals to migrate into the underlying aquifers and occur in their water supply. The DWR evaluated the area hydrogeology in DWR Project Geology Report No 15-10-13 (August 1997). However, local residents remained unconvinced concerning the conclusions drawn by DWR in their report. Local concern appeared to center on whether ground water aquifers in the vicinity of Lake Davis are in communication with the Lake. A team of environmental scientists and hydrogeologists from LLNL reviewed the DWR report and prepared a draft statement of work for the re-evaluation of the Lake Davis hydrogeology. The draft statement of work was provided to Plumas County on March 20, 1998 and can be found in Attachment 8. The draft statement of work specifically pointed out several issues that arose from LLNL's review of the DWR report that should be included in the re-evaluation. These included the integrity of lake sediments to act as a barrier to downward migration of lake water, the nature of faulting on the control of ground water movement, the source of the water feeding area springs, the source of water for the City of Portola municipal wells, whether or not lake water is seeping through underlying materials and surfacing elsewhere, and a further look at water budget calculations referenced by DWR suggesting no water seepage.

A list of primary documents was included in their RFP for use in the hydrogeologic re-evaluation. The consultant was to identify data gaps in the hydrogeologic data and assess the ability to draw definitive conclusions regarding the hydraulic communication between local water supply wells and Lake Davis. The re-evaluation of existing data was to take two months, with an oral presentation on preliminary findings and recommendations to the primary stakeholders. The final report to be due two months after the oral presentation.

Plumas County requested a list of potential bidders to the RFP. LLNL provided a list of possible consultants taken from similar RFPs used by LLNL. The list of potential bidders provided to Plumas County by LLNL is included in Attachment 8 (See Table 6). Plumas County made the final selection of prospective bidders and sent out the RFP with the LLNL statement of work on April 24, 1998. The Plumas County RFP letter can be found in Attachment 8. Eight potential consultants responded with bids. These are listed in Table 6. Plumas County requested that LLNL review the submitted proposals. LLNL agreed to evaluate the proposals against the RFP and provide these evaluations to Plumas County, but Plumas County was to make the final selection. A team of an environmental scientist and hydrogeologist evaluated the proposals according to the criteria presented in Attachment 9. Plumas County selected Leland Gardner and Associates, and work on the re-evaluation began in early July 1998.

Leland Gardner and Associates presented the preliminary results of their evaluation and recommendations to representatives of Plumas County, the City of Portola, CDHS, and CDFG on September 15, 1998. An LLNL team of environmental scientists and hydrogeologists were also present. Because the final report from Leland Gardner and Associates is due in two months, no details on the preliminary findings are presented here. Leland Gardner recommended the collection of additional ground water samples from eleven locations, primarily for major ion chemistry, to help support conclusions being drawn. These samples will be collected and analyzed by CDHS. Plumas County has requested that LLNL review the final report, which is due in early November 1998.

Fish Bioaccumulation Study

During a task force meeting in late May 1998, an observation was made by a local community member that bull head catfish had been observed in Lake Davis. At the time, PBO was still detectable in the lake water samples. The question of the potential for bioaccumulation in any fish that may have survived the treatment or recently migrated into the area was posed. LLNL described the process of bioconcentration (the ability for organisms to concentrate contaminants within their tissues from the surrounding media) and bioaccumulation (the ability of organisms to accumulate contaminants within their tissues as a result of consuming contaminated food), as well as depuration (the ability of organisms to rid themselves of contaminants when placed into a contaminant-free environment, typically done in two phases, a fast phase and slow phase) (Calabrese and Baldwin, 1993). LLNL agreed that the potential for bioaccumulation/bioconcentration existed, and that at a minimum, tissue concentrations of any fish in the lake at that time would have PBO concentrations similar to that found in the water column. This issue was apparently becoming a major concern of local residents, thus Plumas County and the City of Portola expressed a desire that CDFG attempt to catch and analyze the fish. CDFG agreed to do this. LLNL agreed to do a literature search for information concerning bioaccumulation and bioconcentration information of rotenone and PBO, and attempt to locate a laboratory that could conduct the tissue analysis. LLNL also agreed to look into the possibility of LLNL conducting a risk assessment on consuming potentially contaminated fish. CDHS also indicated that they might have some literature on bioconcentration, and that their agency could also potentially do the risk assessment.

The LLNL literature search was able to locate data on rotenone. Bioconcentration factors of 165, 3,330, 125, and 315 were indicated for head, viscera, carcass and whole body for rotenone (Gingerich and Rach, 1985). Maximum tissue concentration occurred within 3 days of exposure. Elimination of rotenone followed the two phase model. After 3 days exposure in uncontaminated water, 81.3% of the rotenone was eliminated from the whole body, after 21 days more than 95% was eliminated. Depuration was most rapid from the viscera, and was slowest for carcass. These data suggested little, if any, detectable rotenone was likely to be in any fish surviving the lake treatment many months after rotenone was no longer detectable in the water column. CDHS provided a copy of the summary to a report by Wildlife International Ltd. on a bioconcentration study on PBO in bluegill conducted as part of USEPA's pesticide registration process (Sved et al., 1992). Like rotenone, uptake was rapid, with final tissue concentrations occurring in 3 days. Also similar to rotenone, the highest concentrations were observed in non-edible tissues compared to edible tissues. Bioconcentration factors of 91, 260 and 380 were reported for edible tissue, whole fish, and non-edible tissues, respectively. Depuration was also biphasic and rapid, by day 7 of the depuration phase, concentrations of PBO were less than the limit of detection in the edible tissues, but still quantifiable in the non-edible tissues. Concentrations of PBO in non-edible tissues continued to decrease slowly from this point.

Thus, the literature review suggested that only PBO had any potential for being detectable in fish tissue. Through a toxicologist in LLNL's Health and Ecological Assessment Division, LLNL was able to locate a laboratory at the University of California, Davis (UC Davis) with experience in conducting fish bioassays. This laboratory's focus was on the histopathological effects of potential carcinogens, and thus they were interested in obtaining properly preserved internal organs as well as tissue samples. At the time this laboratory was contacted, CDFG had captured two bull head catfish, which were kept frozen. CDFG was able to provide the scientific assistant for training by UC Davis in collecting the internal organs and flesh tissue. This collection procedure was based on UC Davis' experience with other contaminants, it was not specific for rotenone or PBO. The UC Davis California Veterinary Diagnostic Laboratory School (CVDLS) was to conduct the actual chemical analysis, and it was necessary for CVDLS to do a full method development, for they also had no direct experience with rotenone or PBO.

During the collection of the catfish prior to restocking Lake Davis with trout, the task force and CDFG determined that it would be wise to sample the restocked trout for subsequent rotenone and PBO analysis, particularly if PBO was still detected in Lake Davis at the time of restocking. In addition, CDFG wished to focus the fish analyses on determining contaminant concentration in flesh tissue. A conference call between UC Davis, CDFG and CDHS was held to discuss a contract with UC Davis for the fish analysis. LLNL also participated in the call. It was decided that CDFG, along with LLNL and CDHS, would work with the UC Davis CVDLS to develop a protocol for sampling the restocked fish, as well as analyzing any fish collected prior to restocking. LLNL agreed to review the protocol. Attachment 10 contains the draft and revised study plan and scope of work for PBO and rotenone residue analysis for fish from Lake Davis. LLNL and CDHS agreed to review the results of the fish tissue concentration analysis.

Restocking of Lake Davis with trout occurred during the week of July 10. At this time, water samples from one location (location 2) still contained PBO concentrations near the detection limit (around 2 µg/L) of PBO. CDFG proceeded with the restocking after a risk assessment conducted by the Office of Environmental Health Hazard Assessment of the California Environmental Protection Agency at the request of the CDFG and reviewed by the CDHS indicated

bioconcentration of PBO in trout would not exceed acceptable concentrations for human consumption. At this time, nineteen catfish (the two whole catfish collected prior to CDFG training on sampling protocol, and seventeen using the original UCD protocol), two bluegill, and one trout (apparently from a CDFG live trout test conducted after the rotenone treatment of Lake Davis) had been collected.

CDFG completed the sampling of the restocked fish using the revised protocol by the public meeting held on September 15, 1998. During the public meeting, CDFG revealed that of the seventeen bullhead catfish collected prior to restocking using the original UCD sampling protocol, half of the samples had been inadvertently discarded during a freezer cleanout. The other half had been discarded due to concerns that the difference in sampling protocol had resulted in insufficient tissue sample for analysis. One of the original two bullhead catfish collected and frozen as a whole fish was discarded due to chain-of-custody concerns. The second bullhead was submitted to UCD CVDLS for analysis. In addition, the single bluegill and two trout were also submitted to UCD CVDLS for analysis. Thus, of the twenty-two fish collected prior to restocking Lake Davis, four were submitted to the UCD CVDLS by CDFG for tissue analysis. Neither LLNL or CDHS were consulted concerning these samples. It may have been possible that sufficient sample was available for analysis, either individually or through compositing of the samples. The California Highway Patrol is conducting an investigation into the discarding of these samples. All of the fish samples collected of the restocked trout were available for submittal to the UCD CVDLS. Due to community concerns expressed during the public meeting, CDFG agreed to embark on an effort to collect additional catfish samples for analysis. LLNL agreed this was a prudent action, as catfish were not restocked by CDFG, and thus any fish captured may also represent fish that may have survived the lake treatment. Although additional time had passed and thus continued contaminant depuration was expected, due to the slow nature of phase two depuration, empirical analytical data concerning the tissue concentration of these species was preferable.

Analytical data received to date show all fish samples to be below the reporting limit of 0.1 milligrams per kilogram (mg/kg) parts per million (ppm) for PBO and 0.05 mg/kg (ppm) for rotenone. However, since no QC data have been received, data validation has not been possible. In addition, LLNL has received verbal reports from CDHS that the CVDLS was able to improve their analytical sensitivity during the course of analyzing the fish samples and detected PBO in all the samples below the reporting limit. CDHS and LLNL have recommended that CDFG approve CVDLS to report these data to allow comparison to predictions derived from modeling using literature values. Such data would make an important contribution to the ecotoxicology literature.

Future Work

The original time frame for LLNL's involvement in the Lake Davis project was expected to be 6 months. However, the lengthy period of time which was required to complete the well water and lake water and sediment sampling, as well as the time required to conduct the hydrogeologic re-evaluation and the addition of the bioaccumulation study resulted in LLNL's involvement continuing to date. Plumas County has requested that LLNL remain involved to review the final report of the hydrogeologic re-evaluation as well as to review the results of the fish tissue concentration analysis. The work in the public interest funding used to conduct this work has been exhausted, and thus a new source of funding to complete this work will need to be secured.

However, LLNL's involvement has been a great asset to Plumas County and the City of Portola during the process of restoring the lake after the treatment process. Thus, every effort should be made to ensure that LLNL can complete the data review still outstanding.

Acknowledgments

Many people participated in the LLNL Lake Davis data evaluation project, and all deserve to be acknowledged. It was a recommendation by Bruce McDowell of LLNL's Operations and Regulatory Affairs Division to Plumas County that resulted in the request from Plumas County for LLNL participation. Thus, this work would not have happened without Bruce's early recognition that LLNL could make a valuable contribution. Bruce also served as a technical advisor on the project. Dave Rice (Environmental Chemistry and Biology Group Leader), John Ziagos (Site 300 Restoration Project Leader) and Fred Hoffman (Hydrogeology Group Leader), all members of LLNL's Environmental Restoration Division (ERD), served as technical advisors, and their guidance was invaluable. Maureen Ridley, also a member of ERD, provided valuable assistance in tracking down relevant literature. Linda Hall, a toxicologist within LLNL's Health and Ecological Assessment Division, made the principal contacts with the laboratory at UC Davis that provided the fish tissue concentration analysis. The support of the management of LLNL's Environmental Restoration Division, which provides the infrastructure to conduct such work, is greatly appreciated.

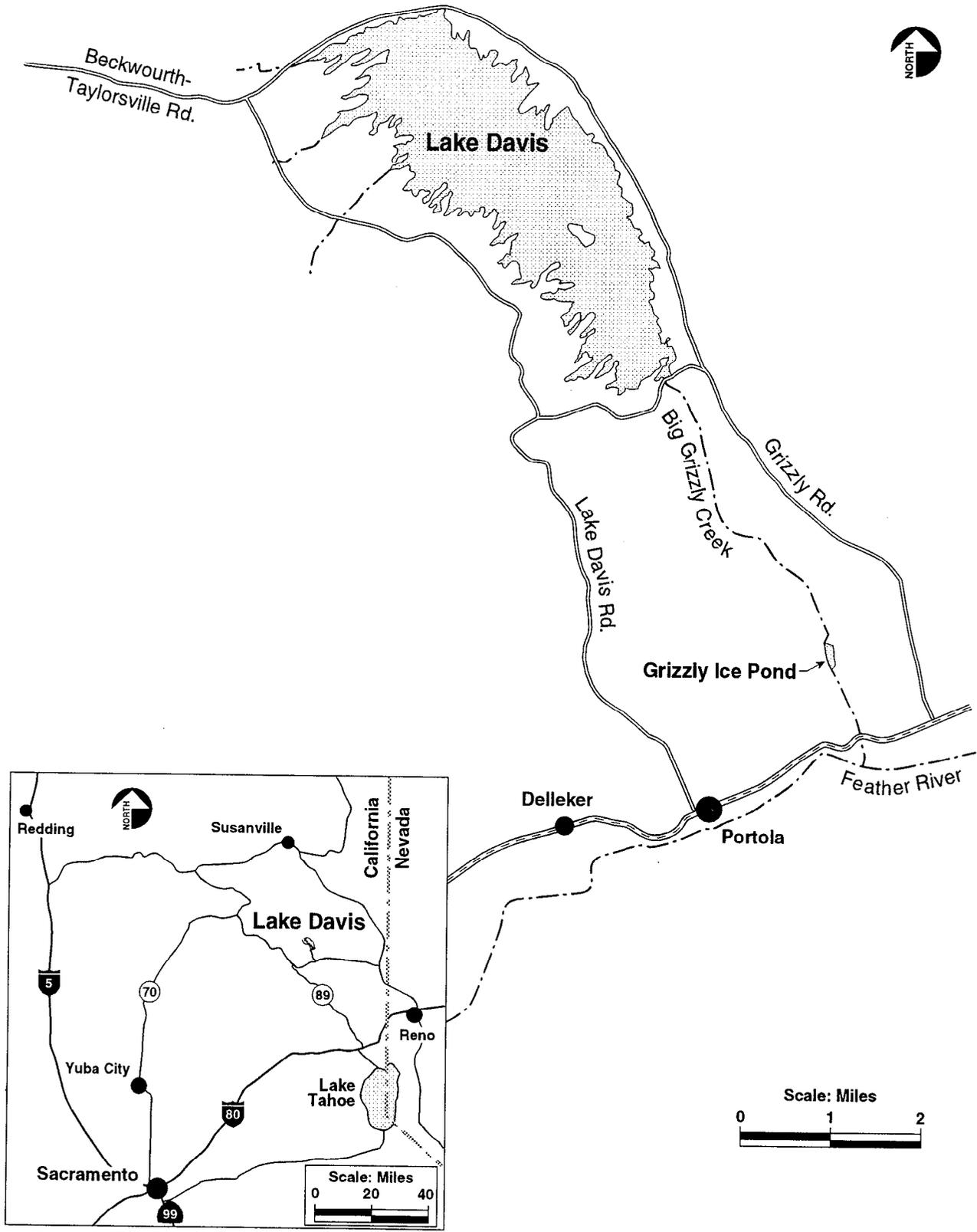
Finally, this project could not have happened without the close working relationship that developed within the Lake Davis Task Force. Fran Roudebush, the Plumas County District I Supervisor, provided the firm political leadership necessary during such a difficult, and at times contentious, project. Dr. David Spath, Chief of the CDHS Division of Drinking Water and Environmental Management, provided amazing leadership among the various state agencies involved, and his efforts made great strides towards rebuilding the trust between all parties involved in the project. Rita Scardaci, Director of the Plumas County Health Department, provided additional valuable leadership for the Task Force. Bill Crigler of the Plumas County Department of Environmental Health was the principle in organizing the well water sampling, and worked closely with CDHS on the lake water and sediment sampling. Tom Hunter, Director of the Plumas County Flood Control, was the principle in organizing the hydrogeologic reevaluation. Bill Powers, City of Portola Council Member, was a driving force behind the fish bioaccumulation study. Jim Murphy, City of Portola Administrator, helped keep all of the pieces from getting lost. Leonard Marsh, Chair of the Restore Lake Davis Committee, provided the valuable community member voice. Nick Villa and Laurie Powers were the local CDFG representatives. Their honesty and integrity, often under difficult circumstances, was greatly appreciated.

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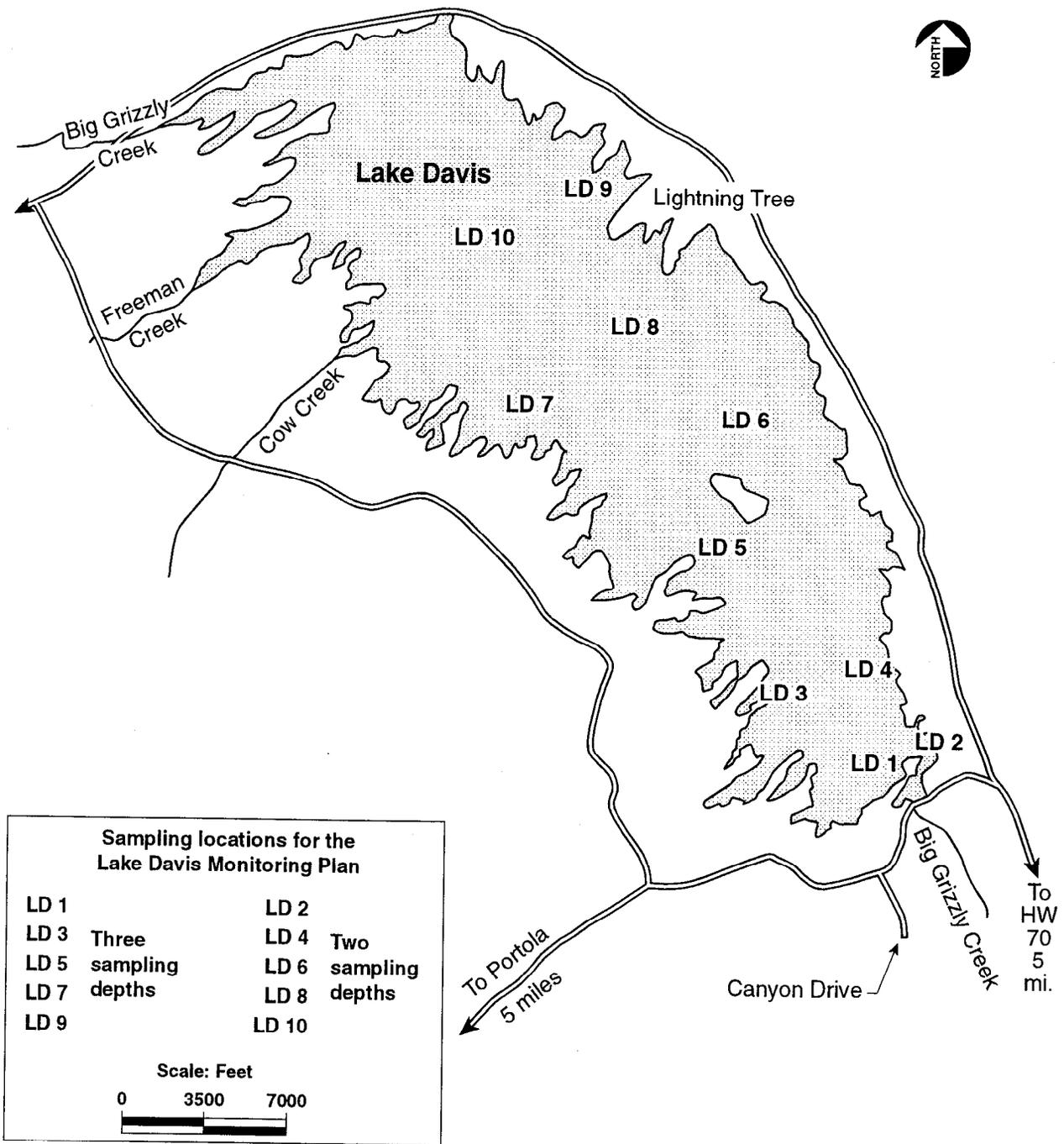
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Figures



ERD-S3R-98-0211

Figure 1. Location of Portola and Lake Davis.



ERD-S3R-98-0212

Figure 2. Map of Lake Davis sampling locations (adapted from CDFG, 1997c).

Tables

Table 1. Summary of results from inter-laboratory collocated samples collected from wells in the vicinity of Lake Davis.

Sample ID	LLNL results^a	NEL laboratories results^b
766 Grizzly Road	ND at 0.5 µg/L	ND at 0.5 µg/L
Parrish	ND at 0.5 µg/L	ND at 0.5 µg/L
6436 Lake Davis Road	ND at 0.5 µg/L	ND at 0.5 µg/L
3511 Grizzly Road	ND at 0.5 µg/L	ND at 0.5 µg/L
3561 Grizzly Road	ND at 0.5 µg/L	ND at 0.5 µg/L

Note:

ND = Not detected.

^a Samples were collected by LLNL and analyzed by Brown and Caldwell Laboratories, Inc., Bakersfield, CA using EPA Method 524.2.

^b Samples collected by Cinde Geddes on contract to NEL and analyzed by NEL using EPA Method 524.2.

Table 2. Summary of ground water data validated by LLNL for Plumas County.

Sample location	Date sampled	Analyses conducted	Date analyzed	Analytes detected	QC data in control?^a	Notes/comments
766 Grizzly	3/04/98	VOCs	3/14/98	ND at 0.5 µg/L	yes	
		PBO	3/07/98	ND at 2 µg/L	yes	
Parrish	3/04/98	VOCs	3/14/98	ND at 0.5 µg/L	yes	
		PBO	3/07/98	ND at 2 µg/L	yes	
6436 Lake Davis Rd.	3/04/98	VOCs	3/14/98	ND at 0.5 µg/L	yes	
		PBO	3/07/98	ND at 2 µg/L	yes	
3511 Grizzly	3/04/98	VOCs	3/15/98	ND at 0.5 µg/L	yes	
		PBO	3/07/98	ND at 2 µg/L	yes	
3561 Grizzly	3/04/98	VOCs	3/14/98	ND at 0.5 µg/L	yes	
		PBO	3/07/98	ND at 2 µg/L	yes	
Lake Davis Cabins	3/20/98	VOCs	3/26/98	ND at 0.5 µg/L	yes	
		PBO	3/25/98	ND at 2 µg/L	yes	
Grizzly Store	3/20/98	VOCs	3/26/98	ND at 0.5 µg/L	yes	
		PBO	3/25/98	ND at 2 µg/L	yes	
7735 Whitethorn	3/20/98	VOCs	3/26/98	ND at 0.5 µg/L	yes	
		PBO	3/25/98	ND at 2 µg/L	yes	
2130 Grizzly	3/20/98	VOCs	3/26/98	ND at 0.5 µg/L	yes	
		PBO	3/25/98	ND at 2 µg/L	yes	
3427 Chipmunk	3/20/98	VOCs	3/26/98	ND at 0.5 µg/L	yes	
		PBO	3/25/98	ND at 2 µg/L	yes	
7797 Buckbrush	3/24/98	VOCs	3/30/98	ND at 0.5 µg/L	yes	
		PBO	3/30/98	ND at 2 µg/L	yes	
1845 Grizzly Road	3/24/98	VOCs	3/30/98	ND at 0.5 µg/L	yes	
		PBO	3/30/98	ND at 2 µg/L	yes	

Table 2. (Continued)

Sample location	Date sampled	Analyses conducted	Date analyzed	Analytes detected	QC data in control? ^a	Notes/comments
1924 Grizzly Road	3/24/98	VOCs	3/30/98	ND at 0.5 µg/L	yes	
		PBO	3/30/98	ND at 2 µg/L	yes	
2895 Grizzly Road	3/24/98	VOCs	3/30/98	ND at 0.5 µg/L	yes	
		PBO	3/30/98	ND at 2 µg/L	yes	
5031 A Grizzly Road	3/24/98	VOCs	3/30/98	ND at 0.5 µg/L	yes	
		PBO	3/30/98	ND at 2 µg/L	yes	
7292 Marilyn Dr.	4/27/98	VOCs	4/30/98	ND at 0.5 µg/L	yes	
		PBO	5/04/98	ND at 2 µg/L	yes	
9090 Marilyn Dr.	4/27/98	VOCs	4/30/98	MTBE at 4.1 µg/L	yes	Sampler's notes indicated this to be seasonal camp-like site. Well was purged for only two minutes.
		PBO	5/04/98	ND at 2 µg/L	yes	
7322 Marilyn Dr.	4/27/98	VOCs	4/30/98	Chloroform 12 µg/L m,p-Xylene 0.8 µg/L	yes	Sampler's notes indicated this to be a seasonal camp-like site. Well was purged for only two minutes, producing a brown, bubbly water. Unidentifiable peaks were also detected in the PBO analysis. Well was resampled on 5/22/98.
		PBO	5/04/98	ND at 2 µg/L	yes	
	5/22/98	VOCs	6/02/98	ND at 0.5 µg/L	yes	Well was resampled to allow for additional purging. Both VOC and PBO analyses had no detectable peaks.
		PBO	5/27/98	ND at 2 µg/L	yes	
7350 Lakeview Cr.	4/27/98	VOCs	4/30/98	ND at 0.5 µg/L	yes	
		PBO	5/04/98	ND at 2 µg/L	yes	
6354 Lake Davis Rd.	4/27/98	VOCs	4/30/98	ND at 0.5 µg/L	yes	
		PBO	5/04/98	ND at 2 µg/L	yes	
7957 Buckbrush	4/27/98	VOCs	4/30/98	ND at 0.5 µg/L	yes	
		PBO	5/04/98	ND at 2 µg/L	yes	

Table 2. (Continued)

Sample location	Date sampled	Analyses conducted	Date analyzed	Analytes detected	QC data in control? ^a	Notes/comments
3185 Fawn Ln.	4/27/98	VOCs	4/30/98	ND at 0.5 µg/L	yes	
		PBO	5/04/98	ND at 2 µg/L	yes	
3311 Fawn Ln.	4/27/98	VOCs	4/30/98	ND at 0.5 µg/L	yes	
		PBO	5/04/98	ND at 2 µg/L	yes	
3251 Fawn Ln.	4/27/98	VOCs	4/30/98	ND at 0.5 µg/L	yes	
		PBO	5/04/98	ND at 2 µg/L	yes	
Shady Hollow Trailers	4/27/98	VOCs	4/30/98	ND at 0.5 µg/L	yes	
		PBO	5/04/98	ND at 2 µg/L	yes	
7110 Lake Davis	4/29/98	VOCs	5/05/98	ND at 0.5 µg/L	yes	
		PBO	5/06/98	ND at 2 µg/L	yes	
58 Pinehaven	4/29/98	VOCs	5/05/98	ND at 0.5 µg/L	yes	
		PBO	5/06/98	ND at 2 µg/L	yes	
7985 Buckbrush	4/29/98	VOCs	5/05/98	ND at 0.5 µg/L	yes	
		PBO	5/06/98	ND at 2 µg/L	yes	
7819 Whitethorn	4/29/98	VOCs	5/02/98	ND at 0.5 µg/L	yes	
		PBO	5/06/98	ND at 2 µg/L	yes	
7286 Marilyn	4/29/98	VOCs	5/02/98	ND at 0.5 µg/L	yes	
		PBO	5/06/98	ND at 2 µg/L	yes	
7294 Canyon	4/29/98	VOCs	5/02/98	ND at 0.5 µg/L	yes	
		PBO	5/06/98	ND at 2 µg/L	yes	
7295 Canyon	4/29/98	VOCs	5/05/98	ND at 0.5 µg/L	yes	
		PBO	5/06/98	ND at 2 µg/L	yes	
7330 Marilyn	4/29/98	VOCs	5/02/98	ND at 0.5 µg/L	yes	
		PBO	5/06/98	ND at 2 µg/L	yes	

Table 2. (Continued)

Sample location	Date sampled	Analyses conducted	Date analyzed	Analytes detected	QC data in control? ^a	Notes/comments
8060 Buckbrush	4/29/98	VOCs	5/05/98	ND at 0.5 µg/L	yes	
		PBO	5/06/98	ND at 2 µg/L	yes	
175 DePersia	4/29/98	VOCs	5/05/98	ND at 0.5 µg/L	yes	
		PBO	5/06/98	ND at 2 µg/L	yes	
1937 Grizzly	4/29/98	VOCs	5/02/98	ND at 0.5 µg/L	yes	
		PBO	5/06/98	ND at 2 µg/L	yes	
1708 Valley View	4/29/98	VOCs	5/02/98	ND at 0.5 µg/L	yes	
		PBO	5/06/98	ND at 2 µg/L	yes	
3225 Fawn	4/29/98	VOCs	5/02/98	ND at 0.5 µg/L	yes	
		PBO	5/06/98	ND at 2 µg/L	yes	
8150 Marilyn	6/12/98	VOCs	6/16/98	ND at 0.5 µg/L	yes	Did not receive sampling notes for this sampling date
		PBO	6/17/98	ND at 2 µg/L	yes	
6066 Lake Davis	6/12/98	VOCs	6/16/98	ND at 0.5 µg/L	yes	Did not receive sampling notes for this sampling date
		PBO	6/17/98	ND at 2 µg/L	yes	
7791 Whitethorn	6/12/98	VOCs	6/16/98	ND at 0.5 µg/L	yes	Did not receive sampling notes for this sampling date
		PBO	6/17/98	ND at 2 µg/L	yes	
2327 Old Grizzly	6/12/98	VOCs	6/19/98	Dichlorodifluoromethane (Freon 12) 2.8 µg/L	yes	Did not receive sampling notes for this sampling date
		PBO	6/17/98	ND at 2 µg/L	yes	
2883 Grizzly	6/12/98	VOCs	6/16/98	ND at 0.5 µg/L	yes	Did not receive sampling notes for this sampling date
		PBO	/17/98	ND at 2 µg/L	yes	
7344 Sharon	6/29/98	VOCs	7/11/98	ND at 0.5 µg/L	yes	
		PBO	7/07/98	ND at 2 µg/L	yes	

Table 2. (Continued)

Sample location	Date sampled	Analyses conducted	Date analyzed	Analytes detected	QC data in control? ^a	Notes/comments
Canyon Drive & Davis Way	6/29/98	VOCs	7/11/98	ND at 0.5 µg/L	yes	
		PBO	7/07/98	ND at 2 µg/L	yes	
7308 Davis Way	6/29/98	VOCs	7/11/98	ND at 0.5 µg/L	yes	
		PBO	7/07/98	ND at 2 µg/L	yes	
5865 Bitterbrush	6/29/98	VOCs	7/11/98	ND at 0.5 µg/L	yes	
		PBO	7/07/98	ND at 2 µg/L	yes	
7791 Whitethorn Trail	6/29/98	VOCs	7/11/98	ND at 0.5 µg/L	yes	
		PBO	7/07/98	ND at 2 µg/L	yes	
3597 Grizzly Road	6/29/98	VOCs	7/11/98	ND at 0.5 µg/L	yes	
		PBO	7/07/98	ND at 2 µg/L	yes	
3119 Grizzly Road	6/29/98	VOCs	7/11/98	ND at 0.5 µg/L	yes	
		PBO	7/07/98	ND at 2 µg/L	yes	

Notes:

VOCs = Volatile organic compounds; EPA Method 524.2.

PBO = Piperonyl butoxide; EPA Method 525.2.

ND = Not detectable.

^a Chain-of-custody (CoC) documentation was not received with any analytical data, thus CoC integrity could not be verified.

Table 3. Summary of piperonyl butoxide results of water samples collected from Lake Davis. Samples were analyzed by NEL and DHS.

Sample location	Date sampled	Date analyzed	Analysis conducted	NEL results (µg/L)	DHS results (µg/L)	Data in control	Notes
1-1	3/19/98	3/25/98	PBO ^a	15		yes ^a	
2-1	3/19/98	3/25/98	PBO	1.9	<i>Faxed to DHS to complete</i>	no	Flagged Je by laboratory, reflecting an estimated concentration above method detection limit but below reporting detection limit.
3-1	3/19/98	3/25/98	PBO	<2		yes ^a	
4-3	3/19/98	3/25/98	PBO	4.6		yes ^a	
5-3	3/19/98	3/25/98	PBO	5.9		yes ^a	

Note:

PBO = Piperonyl butoxide by EPA Method 525.2.

^a No chain-of-custody (CoC) documentation was provided with the analytical data, thus CoC integrity could not be verified.

Table 4a. Results from performance evaluation samples.

Sample ID	Date sampled	Sampler	Analytes requested	Actual concentration	NEL	DHS ^a
Round 1						
PE-1	6/01/98	LLNL	Rotenone in water	4.75 µg/L	6.2 µg/L ^f	5.77 (6.16) µg/L
PE-2	6/01/98	LLNL	PBO in water	4.77 µg/L	33 µg/L ^b	5.66 µg/L ^g
PE-3	6/01/98	LLNL	Rotenone in sediment	47.5 µg/kg	40 µg/Kg	33.2 (32.1) µg/Kg
PE-3	6/01/98	LLNL	PBO in sediment	66.78 µg/kg	<50 µg/Kg	70.9 (71.7) µg/Kg
LLNL single blind	5/28/98	ERA	Naphthalene in water	1.01 µg/L	0.09 µg/L	1.08 µg/L
			TCE in water	1.07 µg/L	1.0 µg/L	1.16 µg/L
			<i>m</i> -xylene in water	1.01 µg/L	-	0.98 µg/L
			<i>o</i> -xylene in water	1.08 µg/L	1.0 µg/L	0.91 µg/L
			<i>p</i> -xylene in water	1.03 µg/L	2.0 µg/L ^g	0.98 µg/L
LLNL single blind	5/28/98	ERA	1-methylnaphthalene in water	2.80 µg/L	<2 µg/L	-
			2-methylnaphthalene in water	2.82 µg/L	<2 µg/L	-
			Naphthalene in water	2.84 µg/L	-	-
LLNL single blind	5/28/98	ERA	Naphthalene in sediment	7.45 µg/Kg	NDR	-
			TCE in sediment	8.08 µg/Kg	NDR	-
			total xylenes in sediment	30.01 µg/Kg	NDR	-
LLNL single blind	5/28/98	ERA	1-methylnaphthalene in sediment	117 µg/Kg	56 µg/Kg ^c	-
			2-methylnaphthalene in sediment	126 µg/Kg	52 µg/Kg ^c	-
			Naphthalene in sediment	131 µg/Kg	-	-

Table 4a. (Continued)

Sample ID	Date sampled	Sampler	Analytes requested	Actual concentration	NEL	DHS ^a
Round 2						
PE-1	6/11/98	LLNL	Rotenone in water	4.75 µg/L	4.9 µg/L	6.69 µg/L
PE-2	6/11/98	LLNL	PBO in water	4.77 µg/L	5.0 µg/L	4.7 µg/L
PE-3	6/11/98	LLNL	Rotenone in sediment	47.5 µg/kg	38 µg/Kg ^r	NDR
PE-3	6/11/98	LLNL	PBO in sediment	66.78 µg/kg	44 µg/Kg ^{je}	NDR
LLNL single blind	6/09/98	ERA	Naphthalene in water	1.51 µg/L	NDR	1.07 (0.94, 0.93) µg/L
			TCE in water	1.50 µg/L	NDR	1.58 (1.54, 1.35) µg/L
			<i>m</i> -xylene in water	1.51 µg/L	NDR	1.64 (1.53, 1.57) µg/L
			<i>o</i> -xylene in water	1.51 µg/L	NDR	1.47 (1.28, 1.29) µg/L
			<i>p</i> -xylene in water	1.44 µg/L	NDR	1.64 (1.53, 1.57) µg/L
LLNL single blind	6/09/98	ERA	1-methylnaphthalene in water	4.20 µg/L	5.0 µg/L ^d	–
			2-methylnaphthalene in water	4.03 µg/L	4.7 µg/L ^d	–
LLNL single blind	6/09/98	ERA	Naphthalene in sediment	7.97 µg/Kg	<5 µg/Kg ^{d,e}	–
			TCE in sediment	7.73 µg/Kg	7 µg/Kg ^{d,e}	–
			<i>m</i> -xylene in sediment	8.07 µg/Kg	–	–
			<i>o</i> -xylene in sediment	7.76 µg/Kg	6 µg/Kg ^{d,e}	–
			<i>p</i> -xylene in sediment	8.24 µg/Kg	14 µg/Kg ^{d,e,g}	–
LLNL single blind	6/09/98	ERA	1-methylnaphthalene in sediment	117 µg/Kg	64 µg/Kg ^f	–
			2-methylnaphthalene in sediment	114 µg/Kg	61 µg/Kg ^f	–

Notes and footnotes appear on following page.

Table 4a. (Continued)**Notes:**

PBO = Piperonyl butoxide.

TCE = Trichloroethylene.

NDR = No data reported.

- = No result expected.

- ^a Although method blank and replicate analysis results were reported, date analyzed and laboratory control standard and surrogate recovery not reported thus full QC data validation could not be conducted.**
- ^b It is unclear from which this sample result came. NEL laboratory report lists Client ID as LLNL single blind but the analysis should have been conducted on the PE-2 sample from LLNL/TMC. Was reported with the ERA single blind results for the methylnaphthalenes.**
- ^c Date sampled listed on NEL report as 6/28/98 assume incorrect and should be 5/28/98.**
- ^d NEL Client ID listed as PE-1. This analysis should have been conducted on an LLNL single blind sample from ERA. Date sampled should have been 6/9/98 (not 6/11/98 as listed on lab report).**
- ^e Holding time missed.**
- ^f NEL Client ID listed as PE-3. This analysis should have been conducted on an LLNL single blind sample from ERA. Date sampled should have been 6/9/98 (not 6/11/98 as listed on lab report).**
- ^g NEL reported the m and p xylene isomers as a combined result.**
- ^{je} = Flagged by laboratory as value below reporting limit but above method detection limit. It should be considered an estimated value.**
- ^r Flagged (J) by laboratory as an estimated concentration due to laboratory control standard failure. These data should be rejected.**

Table 4b. Analysis of performance evaluation samples^a.

Analytes requested	NEL accuracy^b	DHS accuracy^b	NEL/DHS RPD^c	DHS precision^d
Round 1				
Rotenone in water	130.53	121.47	7.18	6.54
PBO in water	691.82	118.66	141.44	
Rotenone in sediment	84.21	69.89	18.58	3.37
PBO in sediment	UD	106.17	UD	1.12
Naphthalene in water	8.91	106.93	169.23	
TCE in water	93.46	108.41	14.81	
m-xylene in water	-^e	97.03		
o-xylene in water	92.59	84.26	9.42	
p-xylene in water	98.04	95.15	2.02	
1-methylnaphthalene in water	UD	-		
2-methylnaphthalene in water	UD	-		
Naphthalene in sediment	NDR	-		
TCE in sediment	NDR	-		
total xylenes in sediment	NDR	-		
1-methylnaphthalene in sediment	47.86	-		
2-methylnaphthalene in sediment	41.27	-		
Percent Completeness^f	81.25	100.00		
Round 2				
Rotenone in water	103.16	140.84	30.89	
PBO in water	104.82	98.53	6.19	
Rotenone in sediment	80.00	NDR		
PBO in sediment	65.89	NDR		

Table 4b. (Continued)

Analytes requested	NEL accuracy ^b	DHS accuracy ^b	NEL/DHS RPD ^c	DHS precision ^d
Naphthalene in water	NDR	70.86		12.94
TCE in water	NDR	105.33		2.56
m-xylene in water	NDR	108.61		6.94
o-xylene in water	NDR	97.35		13.82
p-xylene in water	NDR	113.89		6.94
1-methylnaphthalene in water	119.05	-		
2-methylnaphthalene in water	116.63	-		
Naphthalene in sediment	UD	-		
TCE in sediment	90.56	-		
m-xylene in sediment	- ^e	-		
o-xylene in sediment	77.32	-		
p-xylene in sediment	85.84	-		
1-methylnaphthalene in sediment	54.70	-		
2-methylnaphthalene in sediment	53.51	-		
Percent Completeness ^f	72.22	77.78		

^a - Data not expected, UD=undeterminable as data reported as below detection limit, NDR = no data reported, although data was expected.

^b Accuracy is defined as:
 $(\text{Lab Result} / \text{Actual Concentration}) * 100.$

^c Relative Percent Difference (RPD) is defined as
 $((|\text{Result Lab 1} - \text{Result Lab 2}|) / ((\text{Result Lab 1} + \text{Result Lab 2}) / 2)) * 100.$

^d Precision is defined as:
 $((|\text{Result 1 Lab 1} - \text{Result 2 Lab 1}|) / ((\text{Result 1 Lab 1} + \text{Result 2 Lab 1}) / 2)) * 100.$

^e NEL reported m and p xylene combined.

^f Percent Completeness is defined as:
 $(\text{The number of reported results} / \text{the number of expected results}) * 100.$

Table 5. Summary of Lake Davis water and sediment data from NEL validated by LLNL.

Date sampled	Locations sampled	Matrix sampled	Analyses conducted	Analytes detected ^a	QC data in control?	Notes/ comments
May 12, 1998	1, 3, 5, 7, 9 in duplicate	sediment	VOCs ^b	ND at 70-110 µg/kg	yes ^c	By request of CDFG
May 12, 1998	1, 3, 5, 7, 9 in duplicate	sediment	VOCs ^d	ND at 5 µg/kg	yes ^c	Reanalysis
May 27, 1998	1, 3, 5, 7, 9	sediment	VOCs ^d	ND at 5 µg/kg	yes ^c	
June 12, 1998	1-1 (15'), 1-3 2-1 (75'), 2-2 (40') 2-3 5-1 (20'), 5-3 6-1 (30'), 6-2 (15'), 6-3 9-1 (15'), 9-3 10-1 (10'), 10-2 (5'), 10-3	water	VOCs ^d 1-methylnaphthalene ^e 2-methylnaphthalene ^e	ND at 0.5 µg/L	yes ^c	
	ND at 2 µg/L			yes ^c		
	1-1 (15'), 1-3 2-1 (75'), 2-2 (40') 2-3 3-1 (20'), 3-3 4-1 (60'), 4-2 (30'), 4-3 5-1 (20'), 5-3 6-1 (30'), 6-2 (15'), 6-3 7-1 (15'), 7-3 8-1 (30'), 8-2 (15'), 8-3 9-1 (15'), 9-3 10-1 (10'), 10-2 (5'), 10-3	water	PBO ^f Rotenone ^g Rotenelone ^g	2.8 µg/L in 2-1 (75') ND at 2 µg/L all others	yes ^c	
	ND at 2 µg/L			yes ^c		
				yes ^c		

Table 5. (Continued)

Date sampled	Locations sampled	Matrix sampled	Analyses conducted	Analytes detected ^a	QC data in control?	Notes/comments
	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	sediment	VOCs ^d 1-methylnaphthalene ^e 2-methylnaphthalene ^e	ND at 5 µg/kg ND at 122 - 169 µg/kg	yes ^c yes ^c	Rotenone/Rotnelone Data should be rejected due to poor recovery of laboratory control spike
			PBO ^f Rotenone ^g Rotnelone ^g	ND at 61 - 84.5 µg/kg ND at 30 µg/kg	yes ^c no	
August 4, 1998	1-1 (20'), 1-3 2-1 (70'), 2-3 3-1 (30'), 3-3 4-1 (40'), 4-3 5-1 (30'), 5-3 6-1 (45'), 6-3 7-1 (20'), 7-3 8-1 (40'), 8-3 9-1 (20'), 9-3 10-1 (35'), 10-3	water	PBO ^f	ND at 2 µg/L	yes ^c	Data from 1-3 and 6-1 (45') flagged Jm by NEL, indicating possible matrix effects

^a ND = Not detected.

^b Volatile organic compounds (VOCs) by EPA Method 8260A with EPA Method 5030 methanol extraction; includes naphthalene, trichloroethene (TCE), o-xylene and m,p-xylene.

^c No chain-of-custody (CoC) documentation was provided with the analytical data, thus CoC integrity could not be verified.

^v VOCs by EPA Method 8260A with EPA Method 5030 headspace extraction; includes naphthalene, trichloroethene (TCE), o-xylene and m,p-xylene.

^e Semi-volatile compounds analyzed using EPA Method 525.2.

^f Piperonyl butoxide by EPA Method 525.2.

^g Rotenone and related compounds analyzed using HPLC.

Table 6. Consulting firms that responded to the Plumas County request for proposals for hydrogeological services to re-evaluate the Lake Davis area hydrogeology.

Consulting firm	Address
Weiss Associates	5500 Shellmound Street Emeryville, CA
Leland R. Gardner and Associates	1020 Corporation Way, Suite 208 Palo Alto, CA
Pacific Geoscience	30 Wilder Road San Anselmo, CA
SCS Engineers	3711 Long Beach Boulevard, Ninth Floor Long Beach, CA
Chow Engineering, Inc	7700 Edgewater Drive, Suite 729 Oakland, CA
Jay W. Jones, RG, Ph.D	12726 Via Cortina, Suite 200 Del Mar, CA
Erler & Kalinowski, Inc	1730 South Amphlett Blvd., Suite San Mateo, CA

Attachment 1

**Letter from Plumas County
requesting support from
LLNL**

COUNTY ADMINISTRATIVE OFFICE

520 W. Main Street, Room 10

P.O. Box 10313, Quincy, California 95971, (916) 283-6315 FAX (916) 283-6288



JAMES R. STRETCH
County Administrative Officer
Personnel/Purchasing

October 24, 1997

Bruce McDowell
Lawrence-Livermore National Labs
Mail Code 791
P.O. Box 808
Livermore, CA 94550

SUBJECT: Water Testing Related to Lake Davis
Poisoning

Dear Mr. McDowell:

As you are no doubt aware, the California Department of Fish and Game has poisoned Lake Davis in Plumas County in order to eradicate the Northern Pike fish species. The poisoning began October 15, 1997 and was accomplished by the introduction of 16,000 gallons of liquid Nusyn-Noxfish and 64,000 pounds of powdered Rotenone into the lake.

The community strenuously fought this project for only a year because Lake Davis is their supply of domestic water. The handling of this project over a period of time by Fish and Game officials has been a disaster, not only in the opinion of the community but also State officials at the highest level. The community does not trust any information put out by any State of California agency, whether it's the Department of Fish and Game, Department of Health Services, whomever.

The State has indicated that they will test the water and let the community know when it is safe to put the water system back on line. They will test only three of perhaps 100 wells around the lake of private individuals. The community is not comfortable with that arrangement for the above stated reasons.

We are in contact with you as one of the nation's most credible independent laboratories to engage you in conducting the water analyses related to the Lake Davis poisoning for us. By us I mean either the agreed-upon independent laboratory for both the State and the local community, or the laboratory for the local community as a check on the results that will be reported by the State.

In layman's terms we would like to know what it would cost to provide the following services:

1. Determine whether Lake Davis mixes with the underground aquifers in the area and whether the chemicals introduced in the lake to eradicate the fish population will flow into those aquifers.

2. Determine whether the private wells around Lake Davis are connected with those aquifers and are subject now or sometime in the future to the poisoning
3. Test and determine the baseline chemical constituency of water in every private well around the lake, assuming that you determine that the wells are connected in some way to the lake, to determine that over time, perhaps out a number of years, that the poisoning of the lake does not in any way pose a health risk to the residents.
4. Conduct periodic chemical analyses of the lake water to determine at some future date that the water is perfectly safe to drink - that the county's water system can go back on line provide safe drinking water to the residents.

Because this is not my field there may be other obvious activities and analyses that a lab should also do and I trust that in your response you will suggest what those activities might be and provide us a cost for that also.

As you can appreciate, time is of the essence. We would appreciate your advice on this request as soon as possible.

Sincerely,



James R. Stretch
County Administrative Officer

JRS:clb

cc: Plumas County Board of Supervisors
Greg Stevenson, Mayor, City of Portola
Tom Hunter, Public Works Director
Rita Scardaci, Health Services Director
Bill Crigler, Environmental Health Director

Attachment 2

**Draft LLNL Scope of Work
Provided to Supervisor Frances J. Roudebush
on December 24, 1997**

**Comments on Draft LLNL Scope of Work
from California Department of
Health Services**



Lawrence Livermore National Laboratory

Environmental Protection Department

December 24, 1997

Supervisor Frances J. "Fran" Roudebush
Supervisor, District I, County of Plumas
697 Ridge Street
Portola, CA 96122

Dear Fran,

Attached is the draft scope of work which LLNL will initiate with your approval and the approval of the other agencies involved. Based on our initial meeting it is our understanding that you will serve as the Point of Contact for the primary Local and State agencies and facilitate the review of this document.

Please let us know if you have any questions or suggestions regarding our involvement. We look forward to hearing from and working with you in the future.

Sincerely,

Tina Carlsen
Environmental Scientist

Ellen Raber
Deputy Department Head
Environmental Protection Department

Attachments

cc:

D. K. Fisher, Associate Deputy Director for Operations

Lawrence Livermore National Laboratory

Scope of Work

Lake Davis Area Evaluation Project, Plumas Co., CA.

Introduction

Lake Davis is a reservoir located in the Plumas National Forest, Plumas Co., CA. The California Department of Water Resources (CDWR) operates the reservoir for recreation and to supply domestic water to the city of Portola and the Grizzly Lake Resort Improvement District (CDFG, 1997a). According to the California Department of Fish and Game (CDFG), the highly predaceous, non-native northern pike was found in Lake Davis in 1994 (CDFG, 1997b). CDFG believed the presence of the pike presented a significant threat to California fisheries, particularly to the Sacramento-San Joaquin Delta. As a consequence, the CDFG elected to eradicate all fish from Lake Davis, with subsequent restocking of game trout. The fish eradication was done by treating Lake Davis with formulated Rotenone products on October 15, 1997. Rotenone is a pesticide registered by the U.S. Environmental Protection Agency (EPA) for eradication of fish. Rotenone is a naturally occurring, complex rotenoid, obtained from roots of tropical plants (Extoxnet, 1997). At Lake Davis, two products were used, liquid formulated Nusyn-Noxfish Fish Toxicant, and the powdered Pro-Noxfish Dust Fish Toxicant. Both products contain chemical substances beside Rotenone for dispersing the product, as well as enhancing rotenone fish kill efficacy.

Several state agencies are involved in the Lake Davis eradication project. These include the DWR and CDFG (both Departments within The Resources Agency of California), as well as the Department of Health Services (CDHS) and the Central Valley Regional Water Quality Control Board (RWQCB). The DHS is monitoring the water from Lake Davis to determine when it can be again used as a domestic water supply. The RWQCB issued a Waste Discharge Requirement to the CDFG for discharges of chemical substances into Lake Davis and Big Grizzly Creek.

Local agencies and residents of Plumas County are concerned that the treatment of Lake Davis, its tributaries and discharge, could adversely effect local ground water supplies. Lawrence Livermore National Laboratory (LLNL) was contacted by Mr. James Stretch, Plumas County Administrative Officer to provide assistance in preparing a statement of work to evaluate any potential threat to ground water supplies. LLNL has unique expertise in conducting investigations on the cross-media transport of contaminants to and through ground water. LLNL maintains a scientifically-diverse staff that can provide an integrated view that avoids the focus on a single environmental media, while simultaneously using a broad knowledge of current, state of the art concepts in risk management. In addition, LLNL has a highly controlled quality assurance/quality control program for sample analysis that is more rigorous than commercial programs. Thus, LLNL is uniquely suited to assist local and state agencies in developing the methodology to evaluate the potential, if any, for the treatment of Lake Davis to impact local ground water supplies, as well as to identify any potential risk management implications.

This scope of work details the activities to be conducted by LLNL to assist interested local and state agencies in evaluating the potential impact to area ground water as a consequence of the treatment of Lake Davis. This scope of work lists the primary points of contact, work to be completed, and estimated time frame. The initial work will be done as Work in the Public Interest, consistent with LLNL Financial Policies and Procedures. Recommendations for additional work identified by LLNL will be provided to the local and state agencies, who would then determine the best course of action.

Points of Contact

Primary Lawrence Livermore National Laboratory Point of Contact (POC):

Dr. Tina M. Carlsen
Environmental Scientist
Lawrence Livermore National Laboratory
P.O. Box 808, L-544
Livermore, CA 94551
Ph: (510)422-7103 FAX: (510)423-5764
email: carlsen1@llnl.gov

Other Lawrence Livermore National Laboratory Contacts:

Richard K. Landgraf
Hydrogeologist
Lawrence Livermore National Laboratory
P.O. Box 808, L-544
Livermore, CA 94551
Ph: (510)423-9164 FAX: (510)423-5764
email:

Maureen N. Ridley
Environmental Chemist
Lawrence Livermore National Laboratory
P.O. Box 808, L-528
Livermore, CA 94551
Ph: (510)422-3593 FAX: (510)422-2095
email:

David W. Rice
Env. Chem. & Bio. Group Leader
Lawrence Livermore National Laboratory
P.O. Box 808, L-528
Livermore, CA 94551
Ph: (510)423-5059 FAX: (510) 422-2095
email:

Dr. John Ziagos
Site 300 Env. Restoration Project Leader
Lawrence Livermore National Laboratory
P.O. Box 808, L-544
Livermore, CA 94551
Ph: (510)422-5479 FAX: (510) 423-5764
email:

Bruce K. McDowell
Environmental Assurance Manager,
Decontamination and Waste Treatment Facility
Lawrence Livermore National Laboratory
P.O. Box 808, L-791
Livermore, CA 94551
Ph: (510)423-3261 FAX: (510) 424-3008
email:

Lawrence Livermore National Laboratory
P.O. Box 808, L-
Livermore, CA 94551
Ph: (510) FAX: (510)
email:

Primary Local and State Agency (LSA) Point of Contact (POC):

Supervisor Frances J. "Fran" Roudebush
Supervisor, District I, County of Plumas
Residence:

697 Ridge Street

Portola, CA 96122

Ph: (916)832-4174 FAX: (916)832-4065

Cell Phone: (916)204-4174

Board of Supervisors:

P.O. Box 10207

Quincy, CA 95971

Ph: (916)283-6315 FAX: (916)283-6288

email: rodabsh@psln.com

Other Local and State Agency Contacts:

To Be provided by LSA POC

To Be provided by LSA POC

California Department of Fish and Game

California Department of Water Resources

To Be provided by LSA POC

To Be provided by LSA POC

Calif. Regional Water Quality Control Board

California Department of Health Services

Bill Crigler

Director, Department of Environmental Health
Plumas County, CA

P.O. Box 480

Quincy, CA 95971

Ph: (916)283-6355 FAX: (916)283-6241

email:

Rita Scardaci

Director, Health Department
Plumas County, CA

Ph: (916)283-6342

email:

Tom Hunter

Director, Public Works
Plumas County, CA

1834 East Main

Quincy, CA 95971

Ph: (916)283-6268 FAX: (916)283-6323

email:

James Murphy

City Administrator
City of Portola

35 Third Avenue P.O. Box 1225

Portola, CA 96122

Ph: (530)832-4216 FAX: (530)832-5418

email:

Scope of Work

Phase I Preparation of Statement of Work

LLNL will assist the local and state agencies in preparing a statement of work for an independent environmental contractor to conduct a ground water needs assessment. To do this, LLNL will identify and review available data relevant to the potential for impact to local ground water supplies from the chemical substances added to Lake Davis, its tributaries and drainage during the pike eradication project. Attachment A lists the data requested and received to date relevant to this review. Upon identification and review of the available data, a statement of work will be prepared which may contain the following:

- 1) Summary of events of the treatment of Lake Davis. Summary of known information concerning chemicals used in the treatment of Lake Davis and area hydrogeology. Summary of known data gaps and uncertainties.
- 2) Contractor requirements to further develop a conceptual model of potential ground water impacts and identify chemicals of potential concern along with any additional data gaps or uncertainties in the hydrogeologic model.
- 3) Contractor requirements to identify potential fate and transport mechanisms through relevant environmental media for chemicals of potential concern, potential sources of contaminants, pathways for contaminant transport, and contaminant receptors.
- 4) Contractor requirements to conduct hydrogeologic investigations (such as well drilling, aquifer testing) to fill data gaps and reduce uncertainties in hydrogeologic model. The contractor will conduct any required ground water sampling to validate fate and transport conceptual models.
- 5) Contractor requirements for summary report detailing results of the initial ground water investigation.

A Draft ground water needs assessment statement of work will be prepared by LLNL and submitted to the Local and State Agency Primary Point of Contact (LSA POC). The LSA POC is Supervisor Frances J. "Fran" Roudebush of Plumas County. The LSA POC will distribute copies of the draft statement of work to other state and local agencies for review. The LSA POC will coordinate all review comments, and forward the combined comments to the LLNL POC. The LLNL POC is Dr. Tina M. Carlsen, Environmental Scientist. LLNL will address the comments received and provide a statement of work to the Local and State agencies.

Phase II Ground Water Investigation/ Sample Analysis

During the course of the ground water investigation conducted by the independent contractor, LLNL will provide quality assurance guidance to the local and state agencies to ensure the work is done in a defensible and representative manner. This may include written guidance on the recommended proper sampling and drilling procedures to be used, as well as collection of quality control samples to be analyzed by a state certified contract laboratory independent of that used by the contractor.

Phase III Evaluation and Recommendation

The results of the investigation by the independent contractor will be reviewed by LLNL. LLNL will identify remaining data gaps and uncertainties as well as their potential impact on risk management decisions (i.e. ranking of data gaps and uncertainties with respect to their significance on risk management decisions). LLNL will then make a list of recommendations for filling data gaps and reducing uncertainties, which will be submitted to the state and local agencies.

Suggested Time Frame

Phase I:

Draft Statement of Work to LSA POC: Feb 16, 1998
Comments on Draft Statement of Work to LLNL POC: Mar 2, 1998
Final Statement of Work to LSA POC: Mar 23, 1998

The local and state agencies to procure a contractor, which should be in place by mid-May

Phase II:

Contractor reviews data and generates work and sampling plans: May and June, 1998
Conduct any required ground water investigations: July and August, 1998

Phase III:

Evaluate Results of investigations: September 1998
Draft Recommendations from LLNL to LSA POC: October 15, 1998.

Commitment by LLNL to complete this SOW

LLNL is conducting this work as Public Interest Work. As a consequence, LLNL is limited in the type of work that can be conducted, as well as the amount of resources it can commit. It is difficult to predict how much time any given phase will consume. The LLNL POC will keep the LSA POC up to date concerning progress of the work and availability of resources for future phases.

References

- California Department of Fish and Game. 1997a. *Final Environmental Impact Report Lake Davis Northern Pike Eradication Project. January 1997.* Department of Fish and Game 1416 Ninth Street P.O. Box 944209, Sacramento, CA 94244-2090.
- California Department of Fish and Game. 1997b. The Threat from Northern Pike in Lake Davis to California's Fisheries and How Rotenone is used to Help Manage our Fishery Resources.
- Exttoxnet. 1997. Extension Toxicology Network. Rotenone. <http://ace.orst.edu/cgi-bin/mfs/01/pips/rotenone.p93>

Attachment A
Lake Davis
Ground Water Data Summary
December 15, 1997

Hydrology Data

Received from Plumas County December 8, 1997

- 1) Report from the Department of Water Resources, "City of Portola and Lake Davis Alternate Water Supply Investigation Report", Project Geology Section Report No. 15-10-13, August 1997
- 2) Copy of well logs
- 3) Map of Assessors parcels and wells south of Lake Davis, 1974

Contacts for these data: Bill Crigler, R.E.H.S., M.S.P.H. Director of Plumas County Department of Environmental Health (DEH) (916)283-6355
Barbara Biddle from the office of Rita Scardaci (Head of Plumas County Health Department 916-283-6342) is working on colored version of the map

Assessor Parcel Number with wells which are currently being monitored for chemicals of concern:

25-330-04
25-251-04
25-240-51
25-240-72

- 3) Seasonal Lake Temperature Gradients: Collected monthly from May through September at the two inlets from the lake to the treatment system (5760 ft and 5740 ft) and manually recorded in a notebook. Not currently summarized in any publication. Received a photocopy of the last two years of data in the mail from Ralph Howell (916-832-5283), Watermaster for the Department of Water Resources at the Beckwourth Subcenter (Beckwourth is near Lake Davis).

Status of Outstanding Data

- 2) Dam preconstruction hydrology info, ground water basin data, and dam geologic data will need to be obtained from the DWR Red Bluff Office. Contact point is John Clements (530-529-7369) or possibly Jerry Boles (no number available).

Chemical/ Water Quality Data

Received from Plumas County December 8, 1997

- 1) Letter dated November 25, 1997 from Plumas Co. DEH to residents asking if well testing requested

- 2) Summary of Lake Davis Well Test Requests- Bill Crigler point of contact

- 3) Summary of Lake Davis Chemical Analyses Averaged over Entire Lake.

Contacts for this Data: Pamela A. Johnson, P.E., Department of Health Services, Redding, CA. (916) 224-4868

This contains the list of chemicals of concern developed by DHS. Of special note is Rotenolone (the oxidized form of rotenone) and Piperonyl Butoxide (a synergist which enhances fish susceptibility to rotenone)

- 4) Specimen Label for Nusyn-Noxfish and Pro-Noxfish

- 5) Nusyn-Noxfish MSDS (although indicated as such, the MSDS for Potassium Permanganate is not included).

6) Copy of Label of Pro-Noxfish Dust that community members obtained from a barrel left at the treatment site.

Status of Outstanding Data

1) Pamela Johnson indicated the following data may be available from DHS:

- Analytical Reports and associated QC for all water and sediment data (both CDFG and DHS data)
- Some baseline sediment data
- Analytical methodology
- List of chemicals of potential concern
- Details on water treatment methods

Verbally Pam indicated the water is treated with alum, precipitated and filtered, then chlorinated prior to distribution

Pam was very clear a contact need to be made with a Dr. David Spath at the DHS Redding office to get his approval prior to release of this additional data.

2) Analytical data from monitored wells. It is not clear whether DEH or DHS maintains this data, may need to contact both.

3) Water Quality Data collected on the Lake by DWR. Watermaster Ralph Howell collects samples for dissolved oxygen, pH, turbidity, secchi disc reading, phytoplankton, and MTBE from the lake. However, he does not maintain much of the results. Summary reports of this data will need to be obtained from Berry Montoya (916-653-4383) Operations and Maintenance, Water Quality Division of DWR in Sacramento. His boss is Jeff Janik. Will need to request water quality reports for the Upper Feather River Lakes, Lake Davis.

Miscellaneous Information

Received from Plumas County December 8, 1997

1) Letter dated December 3, 1997 from the Secretary for The Resources Agency of California to area Community Leaders concerning actions taken by the various state agencies.

2) A packet of letters and memoranda referred to by community members as "The Good Book" documenting interactions with various agencies.

3) Copy of EIR/EIS: Bruce McDowell obtained from Sacramento.

FRAN ROUDEBUSH PAGE 01

BOARD OF SUPERVISORS



FRANCES J. ROUDEBUSH, DISTRICT 1
ROBERT A. MEACHER, DISTRICT 2
BIL DENNISON, DISTRICT 3
PHILIP A. BRISQWANE, DISTRICT 4
BILL COATES, DISTRICT 5

FAX TRANSMITTAL SHEET

Date: 1-29-98

Number of pages (including this sheet) 2

FAX number: 510-423-5764

Sent to: Lina Carlson

Firm name: LLNL

Sent from: Eran Roudabush

Department: Plumas County Board of Supervisors

Phone: (916) 832-4174 FAX (916) 832-4065

NOTE:

State of California

Department of Health Services

Memorandum

Filed to Branham

1-16-98

Date: January 15, 1998

To: Joseph P. Munso
Chief Deputy Director
714 P Street, Room 1253Via: Mike Genest
Assistant Deputy Director
Prevention Services
714 P Street, Room 1492From: Division of Drinking Water and
Environmental Management
601 North 7th Street, MS 216
322-2308

Subject: Comments on Lawrence Livermore National Laboratory's (LLNL) Proposal - Lake Davis

The following are comments on LLNL's proposed scope of work, Lake Davis Area Evaluation Project.

In this document:

1. LLNL presumes that the state agencies are in agreement that this work needs to be undertaken. I do not agree with that presumption. In making our determination that there would be no permanent adverse impact on the water quality of Lake Davis and surrounding groundwater we stated that there was no basis to assume that the groundwater would be adversely impacted. Evidence presented by the Department of Water Resources (DWR) on the hydrogeology supported that position. We have agreed to sample selected wells which DWR identified as most likely to be impacted by the Lake. I think that we should maintain our position and continue with our sampling plan. ~~This work should be viewed as a local proposal to which we will provide input but we should not sponsor this work.~~
2. The scope of work is very ambitious, potentially quite expensive, and the time frame for completion is unrealistic. The proposal envisions the development of a conceptual hydrogeologic model within two months and then another two months to fill in data gaps and uncertainties in the model based on an assessment of available information on data and transport of the chemical contaminants of concern. To acquire the additional data needed to validate the model, LLNL proposes groundwater sampling including the drilling of monitoring wells. To complete all this work would take much longer than four months, particularly if a significant number of monitoring wells are determined to be needed. The drilling of monitoring wells will also significantly impact the cost of the project.
3. The overall scientific approach described in the scope of work, which would develop a conceptual hydrogeologic model to attempt to predict the potential impact of chemicals in the Lake on the groundwater and then validate the model with empirical data, is reasonable. As I indicated above, if the County believes that it is necessary to undertake the work, they should proceed. However, we should only provide technical input.

If you have any questions, please call me.


David P. Spatti, Ph.D., P.E., Chief

sampling plan. This work should be viewed as a local proposal to which we will provide input but we should not sponsor this work.

TOTAL P.002

As per Fran Roubelush 1/29/98 TMC

Attachment 3

Revised LLNL Scope of Work

Lawrence Livermore National Laboratory

Scope of Work

Lake Davis Area Evaluation Project, Plumas Co., CA.

Introduction

Lake Davis is a reservoir located in the Plumas National Forest, Plumas Co., CA. The California Department of Water Resources (CDWR) operates the reservoir for recreation and to supply domestic water to the city of Portola and the Grizzly Lake Resort Improvement District (CDFG, 1997a). According to the California Department of Fish and Game (CDFG), the highly predaceous, non-native northern pike was found in Lake Davis in 1994 (CDFG, 1997b). CDFG believed the presence of the pike presented a significant threat to California fisheries, particularly to the Sacramento-San Joaquin Delta. As a consequence, the CDFG elected to eradicate all fish from Lake Davis, with subsequent restocking of game trout. The fish eradication was done by treating Lake Davis with formulated Rotenone products on October 15, 1997. Rotenone is a pesticide registered by the U.S. Environmental Protection Agency (EPA) for eradication of fish. Rotenone is a naturally occurring, complex rotenoid, obtained from roots of tropical plants (Extoxnet, 1997). At Lake Davis, two products were used, liquid formulated Nusyn-Noxfish Fish Toxicant, and the powdered Pro-Noxfish Dust Fish Toxicant. Both products contain chemical substances beside Rotenone for dispersing the product, as well as enhancing rotenone fish kill efficacy.

Several state agencies are involved in the Lake Davis eradication project. These include the CDWR and CDFG (both Departments within The Resources Agency of California), as well as the Department of Health Services (CDHS) and the Central Valley Regional Water Quality Control Board (RWQCB). The CDHS is monitoring the water from Lake Davis to determine when it can be again used as a domestic water supply. The RWQCB issued a Waste Discharge Requirement to the CDFG for discharges of chemical substances into Lake Davis and Big Grizzly Creek.

Local agencies and residents of Plumas County are concerned that the treatment of Lake Davis, its tributaries and discharge, could adversely effect local ground water supplies. Lawrence Livermore National Laboratory (LLNL) was contacted by Mr. James Stretch, Plumas County Administrative Officer to provide assistance in preparing a statement of work to evaluate any potential threat to ground water supplies. Although the hydrogeology of the Lake Davis area has been evaluated by the Department of Water Resources (**citation**), local residents remain unconvinced concerning the conclusions made by the CDWR. Concern appears to be centered on whether ground water aquifers in the vicinity of Lake Davis are in communication with the lake. LLNL has unique expertise in conducting investigations on the cross-media transport of contaminants to and through ground water. LLNL maintains a scientifically-diverse staff that can provide an integrated view that avoids the focus on a single environmental media, while simultaneously using a broad knowledge of current, state of the art concepts in risk management. In addition, LLNL has a highly controlled quality assurance/quality control program for sample analysis that is more rigorous than most commercial programs. Thus, LLNL is uniquely suited to assist local and state agencies in reevaluating the potential, if any, for the treatment of Lake Davis to impact local ground water supplies, as well as to identify any potential risk management implications. LLNL agreed to assist the local and state agencies in reevaluating the potential threat the treatment of Lake Davis posed to the area ground water. LLNL proposed to conduct the initial work as Work in the Public Interest, consistent with LLNL Financial Policies and Procedures.

LLNL prepared a draft scope of work (SOW) which detailed the activities to be conducted by LLNL to assist the local and state agencies in reevaluating the potential impact to area ground water as a consequence of the treatment of Lake Davis. The draft scope of work was divided into three

phases. In Phase 1, LLNL was to prepare a draft statement of work for inclusion into a Request for Proposals for a private contractor to review the ground water evaluation conducted by the DWR, as well as to develop a work plan for conducting additional hydrogeologic investigation if any are found necessary. LLNL's involvement was limited to assisting with writing the statement of work and reviewing the private contractors recommendations. Phase II consisted of the private contractor conducting any further hydrogeologic investigation that was identified in Phase II. LLNL's involvement was limited to conducting a quality control evaluation of any environmental samples collected. During Phase III, LLNL was to review the results of the hydrogeologic investigation, and make a list of recommendations to be submitted to the state and local agencies.

The draft SOW was FAXed to Plumas County Supervisor Fran Roudebush, who was identified as the local and state agency Point of Contact (POC), on December 22, 1997. Supervisor Roudebush forwarded the SOW to the state agencies of interest. Upon completion of review of the draft SOW by all interested agencies, a conference call was held on January 8, 1998 to discuss the draft SOW. In addition, LLNL received a copy of written comments on the Draft SOW from DHS through Supervisor Roudebush. The state agencies indicated that their current priority was procuring an independent analytical laboratory to conduct analyses of lake and sediment samples which are in the process of being collected. LLNL indicated that they could not actually conduct such analysis, but could conduct an independent data validation of the subsequent results. A private analytical laboratory, Nevada Environmental Laboratory (NEL), was discussed, and all agreed this laboratory appeared suitable for conducting the independent analyses. Concern was also expressed by the agencies that the SOW assumed that additional hydrogeologic investigation would be necessary. LLNL assured the agencies this was not intended to be the case, that additional hydrogeologic investigation would be conducted only if found to be necessary as a result of the independent review of the existing hydrogeologic evaluation. LLNL acknowledged that both the review of the hydrogeologic evaluation and any subsequent hydrogeologic investigation could potentially be very time consuming and expensive. At the conclusion of the teleconference, LLNL agreed to investigate whether the SOW could be modified to include the data validation of the lake and sediment samples, as well as how to make the SOW more explicit in terms of the phased approach towards the ground water evaluation.

Subsequent telephone conversations between LLNL and Plumas County also identified the need for data validation of ground water samples currently being collected in the vicinity of Lake Davis, the cost of which is being born by Plumas County. In addition, it was determined at LLNL could not bear the cost of the analysis of the lake and sediment samples by NEL, but could conduct the data validation. As a result of these telephone conversations, LLNL agreed to modify the draft SOW to contain three components: 1) data validation of lake and sediment samples which are to be collected by CDHS and sent to NEL, 2) data validation of ground water samples collected by Plumas County, and 3) preparation of a draft statement of work for inclusion into a RFP for independent review of the existing hydrogeologic evaluation. The completion of these three phases will likely exhaust the funding available to LLNL to conduct work in the public interest. Plumas County would then be responsible for obtaining bids to the RFP and locating a funding source for the work. Any involvement by LLNL for reviewing the results of the hydrogeologic review as well as any potential follow-on investigation would be subject to available funding. As with the original draft, this scope of work lists the primary points of contact, work to be completed, and estimated time frame.

Points of Contact

Primary Lawrence Livermore National Laboratory Point of Contact (POC):

Dr. Tina M. Carlsen
Environmental Scientist
Lawrence Livermore National Laboratory
P.O. Box 808, L-544
Livermore, CA 94551
Ph: (510)422-7103 FAX: (510)423-5764
email: carlsen1@llnl.gov

Other Lawrence Livermore National Laboratory Contacts:

Richard K. Landgraf
Hydrogeologist
Lawrence Livermore National Laboratory
P.O. Box 808, L-544
Livermore, CA 94551
Ph: (510)423-9164 FAX: (510)423-5764
email:

Valerie R. Dibley
Environmental Chemist
Lawrence Livermore National Laboratory
P.O. Box 808, L-528
Livermore, CA 94551
Ph: (510)422-9777 FAX: (510)422-2095
email:

David W. Rice
Env. Chem. & Bio. Group Leader
Lawrence Livermore National Laboratory
P.O. Box 808, L-528
Livermore, CA 94551
Ph: (510)423-5059 FAX: (510) 422-2095
email:

Dr. John Ziagos
Site 300 Env. Restoration Project Leader
Lawrence Livermore National Laboratory
P.O. Box 808, L-544
Livermore, CA 94551
Ph: (510)422-5479 FAX: (510) 423-5764
email:

Bruce K. McDowell
Environmental Assurance Manager,
Decontamination and Waste Treatment Facility
Lawrence Livermore National Laboratory
P.O. Box 808, L-791
Livermore, CA 94551
Ph: (510)423-3261 FAX: (510) 424-3008
email:

Maureen Ridley
Environmental Chemist
Lawrence Livermore National Laboratory
P.O. Box 808, L-528
Livermore, CA 94551
Ph: (510)422-3593 FAX: (510)422-2095
email:

Primary Local and State Agency (LSA) Point of Contact (POC):

Supervisor Frances J. "Fran" Roudebush
Supervisor, District I, County of Plumas
Residence:
697 Ridge Street
Portola, CA 96122
Ph: (916)832-4174 FAX: (916)832-4065
Cell Phone: (916)204-4174
Board of Supervisors:
P.O. Box 10207
Quincy, CA 95971
Ph: (916)283-6315 FAX: (916)283-6288
email: rodabsh@psln.com

Other Local and State Agency Contacts:

To Be provided by LSA POC

California Department of Fish and Game

To Be provided by LSA POC

Calif. Regional Water Quality Control Board

Bill Crigler
Director, Department of Environmental Health
Plumas County, CA
P.O. Box 480
Quincy, CA 95971
Ph: (916)283-6355 FAX: (916)283-6241
email:

Tom Hunter
Director, Public Works
Plumas County, CA
1834 East Main
Quincy, CA 95971
Ph: (916)283-6268 FAX: (916)283-6323
email:

To Be provided by LSA POC

California Department of Water Resources

To Be provided by LSA POC

California Department of Health Services

Rita Scardaci
Director, Health Department
Plumas County, CA

Ph: (916)283-6342
email:

James Murphy
City Administrator
City of Portola
35 Third Avenue P.O. Box 1225
Portola, CA 96122
Ph: (530)832-4216 FAX: (530)832-5418
email:

Scope of Work

Component I: Validation of Lake and Sediment Sampling

LLNL will conduct an independent validation of the ongoing lake and sediment sampling. The validation will consist of analysis of the quality control data generated by the contract analytical laboratories, and analysis of the results of inter- and intralaboratory split samples. The primary independent contract laboratory will be Nevada Environmental Laboratory. A funding source for the analyses at this laboratory has yet to be determined, but is assumed to be either CDHS or CDFG. LLNL will provide to NEL data deliverable requirements for validation of the quality control data (Attachment A). LLNL will be present during at least one round of lake and sediment sampling to observe the sampling and collect a set of samples to be submitted to analytical laboratories under contract to LLNL. In addition to being California State Certified and participating in state and federal performance evaluation programs, these laboratories have met rigorous LLNL acceptance criteria and participate in LLNL's ongoing performance evaluation program. Analytical results and data deliverables from NEL will be sent directly to both the contracting agency (CDHS or CDFG) and the LLNL Point of Contact (POC). After each round of sampling, LLNL will provide the LSA POC copies of the flagged analytical resulting from the quality control validation, as well as results of the analysis of any intra- or interlaboratory split samples obtained during that sampling round. Upon completion of the lake and sediment sampling program, LLNL will prepare a summary report of the results of the QC and inter-/intralaboratory sample analysis. The LLNL POC will submit the report to the Local and State Agency (LSA) POC. The validation will only identify the quality of the analytical results, and will not draw conclusions based on those results.

Component II. Validation of Lake Davis Area Ground Water Samples

LLNL will conduct an independent validation of private well drinking water samples collected and analyzed by NEL for Plumas County. The validation will consist of analysis of the quality control data generated by the contract analytical laboratories, and analysis of the results of inter- and intralaboratory split samples. LLNL will provide to NEL data deliverable requirements for LLNL data validation. LLNL will also visit NEL to review the laboratory based on standard laboratory practices. An LLNL representative will observe at least one sampling event and will collect a set of samples to be submitted to analytical laboratories under contract to LLNL. Upon completion of the validation, LLNL will prepare a summary report of the results of the QC and inter-/intralaboratory sample analysis. The LLNL POC will submit the report to the Local and State Agency (LSA) POC. The data validation will only identify the quality of the analytical results, and will not draw conclusions based on those results, nor comment on the applicability of the wells selected for sampling.

Component III Preparation of Statement of Work

LLNL will assist the local and state agencies in preparing a statement of work for an independent environmental contractor to conduct a reevaluation of the Lake Davis area hydrogeology. To do this, LLNL will identify and conduct a preliminary review of available data relevant to the potential for impact to local ground water supplies from the chemical substances added to Lake Davis, its tributaries and drainage during the pike eradication project. Attachment B lists the data requested and received to date relevant to this review. Upon identification and review of the available data, a statement of work will be prepared which may contain the following:

- 1) Summary of events of the treatment of Lake Davis. Summary of known information concerning chemicals used in the treatment of Lake Davis and area hydrogeology. Summary of known data gaps and uncertainties. Identification of known existing data sources (both primary and secondary).

- 2) Contractor requirements to conduct the hydrogeologic reevaluation. The primary focus will be to develop a hydrogeologic model of the Lake Davis area using existing information, particularly with respect to any potential aquifer and lake communication.
- 3) Contractor requirements to identify potential fate and transport mechanisms for the chemicals used in Lake Davis using the developed hydrogeologic model. Potential sources and sinks of chemicals, pathways for chemical transport, and potential receptors should be identified.
- 4) Contractor requirements for summary report detailing results of the hydrogeologic reevaluation. This report will include identification of any data gaps or uncertainties in the hydrogeologic model, and recommended work required to fill the data gaps and reduce identified uncertainties. Presentation of the findings to the local and state agencies and the public may be required either before or after preparation of the formal report.

A draft hydrogeologic reevaluation statement of work will be prepared by LLNL and submitted to the Local and State Agency Primary Point of Contact (LSA POC). The LSA POC will distribute copies of the draft statement of work to other state and local agencies for review. The LSA POC will coordinate all review comments, and forward the combined comments to the LLNL POC. LLNL will address the comments received and provide a statement of work to the Local and State agencies.

Future Work

Upon completion of the draft Statement of Work, Plumas County should release the Request for Proposals and obtaining bids on the RFP. A funding source for the hydrogeologic reevaluation should be identified. At this point, it is likely that LLNL will have exhausted the funding made available as work in the public interest. While LLNL could provide review of the contractor's report and recommendations, this assistance may be limited due to funding constraints.

Once the hydrogeologic reevaluation is complete, a decision point is reached concerning future work. This will be based on the recommendations made by the contractor as a result of the reevaluation. If additional ground water investigation is deemed necessary, LLNL could again provide independent quality assurance review to ensure the work is done in a defensible and representative manner. This may include a review of sampling and drilling procedures to be used, as well as collection of quality control samples to be analyzed by a state certified contract laboratory independent of that used by the contractor. In addition, the results of the investigation by the independent contractor could be reviewed by LLNL. LLNL could assist in the identification of remaining data gaps and uncertainties as well as their potential impact on risk management decisions (i.e. ranking of data gaps and uncertainties with respect to their significance on risk management decisions). However, LLNL involvement may be limited due to funding constraints.

Suggested Time Frame

Component I:

Work to be completed between February and March, dependent upon sampling schedule and length of time for analytical laboratory to provide LLNL with data deliverables. Upon receipt of data deliverables, data validation will take approximately two weeks.

Component II:

Work to be completed between February and March, dependent upon sampling schedule and length of time for analytical laboratory to provide LLNL with data deliverables. Upon receipt of data deliverables, data validation will take approximately two weeks.

Upon completion of the data validation, final report preparation will take approximately two weeks.

Component III:

Draft Statement of Work to LSA POC: Mar 20, 1998

Comments on Draft Statement of Work to LLNL POC: Apr 3, 1998

Final Statement of Work to LSA POC: Apr 20, 1998

Future Work

The local and state agencies to procure a contractor, which should be in place by mid-May

Review of the existing hydrogeologic evaluation should take approx. 2 months with a presentation of the findings to the local and state agencies on the findings upon completion of this review. The formal report may take additional preparation time.

Length of time for any field investigation dependent upon the results of the hydrogeologic evaluation review, but should be planned for the summer months.

Commitment by LLNL to complete this SOW

LLNL is conducting this work as Public Interest Work. As a consequence, LLNL is limited in the type of work that can be conducted, as well as the amount of resources it can commit. It is difficult to predict how much time any given phase will consume. The LLNL POC will keep the LSA POC up to date concerning progress of the work and availability of resources for future phases.

Estimated duration of the project

6 months

References

California Department of Fish and Game. 1997a. *Final Environmental Impact Report Lake Davis Northern Pike Eradication Project. January 1997.* Department of Fish and Game 1416 Ninth Street P.O. Box 944209, Sacramento, CA 94244-2090.

California Department of Fish and Game. 1997b. *The Threat from Northern Pike in Lake Davis to California's Fisheries and How Rotenone is used to Help Manage our Fishery Resources.*

Exttoxnet. 1997. Extension Toxicology Network. Rotenone. <http://ace.orst.edu/cgi-bin/mfs/01/pips/rotenone.p93>

Attachment A
Deliverables required for
Lawrence Livermore National Laboratory
Data Validation

During the Sampling Event:

Recommended Field QC:

- Daily trip blanks
- Collocated samples collected from 10% of sampling locations for each sampling round
- Periodic field blanks useful but not absolutely necessary
- If non-dedicated sampling equipment used, equipment rinsate blanks should be collected and analyzed

From the Sample Analyses:

Analytical Results for:

- Samples (lake water, lake sediment, or well water)
- Intralaboratory collocated samples
- Trip blank samples
- Any field blank samples
- Any equipment blank samples

Official Hardcopy Deliverables from the analytical laboratory

The official hardcopy deliverables should include:

- i Case Narrative
- ii Chain-of-Custody (COC)
- iii Summary of Analytical Results
- iv Summary of QC Sample Results

The specific information necessary for data validation is described below:

i) Case Narrative

A Case Narrative, on letterhead of the lab performing the analysis, shall include:

- Sample identification and corresponding laboratory identification.
- Analysis performed.
- Indication of whether holding times were exceeded.
- Observation of any occurrence that may have affected sample integrity or data quality.
- Detailed description of all problems encountered with special attention to results associated with QC outside of acceptance limits.
- Statement saying all calibration acceptance criteria were met, or if not, an explanation.
- Authorization by lab director or designee for release of data.

ii) Chain-of-Custody (COC) and Sampling Documentation

A legible copy of the COC shall be included with the results with all the appropriate receiving and relinquishing signatures and dates.

iii) Summary of Analytical Results

For each sample analysis, the following information should be included:

- COC number.
- Sample identification and laboratory sample ID.
- Sample QC batch number.
- Sample collection date and date the laboratory received the sample.
- Sample matrix.
- Date/time and method used for sample extraction, if applicable.
- Analysis method.
- Date/time of analysis.
- Analyte and CAS number.
- Analytical results and units.
- Dilution or concentration factor of the samples.
- The reporting limit.
- Data qualifier flags, if any, and their definitions.
- Any applicable notes or comments.
- California State Certification Number.

iv) Summary of QC Sample Results

The laboratory shall report the results for the analysis of QC samples listed below for each batch of twenty samples or less:

- Method blank
- Matrix spikes and matrix spike duplicate.
- Laboratory control samples or standards.
- Surrogates, when applicable.

For each of the QC sample, the following information should be provided:

- QC batch number
- Date/time of analysis
- Analysis method
- Data qualifier flags, if any, and their definitions
- Acceptance or Control limits.
- Analytical results including percent recoveries and relative percent difference as appropriate.

In addition, the laboratory should maintain the following information and make it available upon request:

- Initial and continuing calibration data.
- Method detection limit determinations.
- Laboratory QC control charts.
- GC/MS tune data.
- Raw data including run logs, standard preparation logbooks and chromatographs.

While the official hardcopy report is being prepared, preliminary results should be made available as soon as possible.

Attachment B
Lake Davis
Ground Water Data Summary
December 15, 1997

Hydrology Data

Received from Plumas County December 8, 1997

1) Report from the Department of Water Resources, "City of Portola and Lake Davis Alternate Water Supply Investigation Report", Project Geology Section Report No. 15-10-13, August 1997

2) Copy of well logs

3) Map of Assessors parcels and wells south of Lake Davis, 1974

Contacts for these data: Bill Crigler, R.E.H.S., M.S.P.H. Director of Plumas County
Department of Environmental Health (DEH) (916)283-6355
Barbara Biddle from the office of Rita Scardaci (Head of Plumas
County Health Department 916-283-6342) is working on colored
version of the map

Assessor Parcel Number with wells which are currently being monitored for chemicals of concern:

25-330-04

25-251-04

25-240-51

25-240-72

3) Seasonal Lake Temperature Gradients: Collected monthly from May through September at the two inlets from the lake to the treatment system (5760 ft and 5740 ft) and manually recorded in a notebook. Not currently summarized in any publication. Received a photocopy of the last two years of data in the mail from Ralph Howell (916-832-5283), Watermaster for the Department of Water Resources at the Beckwourth Subcenter (Beckwourth is near Lake Davis).

Status of Outstanding Data

2) Dam preconstruction hydrology info, ground water basin data, and dam geologic data will need to be obtained from the DWR Red Bluff Office. Contact point is John Clements (530-529-7369) or possibly Jerry Boles (no number available).

Chemical/ Water Quality Data

Received from Plumas County December 8, 1997

1) Letter dated November 25, 1997 from Plumas Co. DEH to residents asking if well testing requested

2) Summary of Lake Davis Well Test Requests- Bill Crigler point of contact

3) Summary of Lake Davis Chemical Analyses Averaged over Entire Lake.

Contacts for this Data: Pamela A. Johnson, P.E., Department of Health Services, Redding,
CA. (916) 224-4868

This contains the list of chemicals of concern developed by DHS. Of special note is Rotenolone (the oxidized form of rotenone) and Piperonyl Butoxide (a synergist which enhances fish susceptibility to rotenone)

4) Specimen Label for Nusyn-Noxfish and Pro-Noxfish

5) Nusyn-Noxfish MSDS (although indicated as such, the MSDS for Potassium Permanganate is not included).

6) Copy of Label of Pro-Noxfish Dust that community members obtained from a barrel left at the treatment site.

Status of Outstanding Data

- 1) Pamela Johnson indicated the following data may be available from DHS:
 - Analytical Reports and associated QC for all water and sediment data (both CDFG and DHS data)
 - Some baseline sediment data
 - Analytical methodology
 - List of chemicals of potential concern
 - Details on water treatment methodsVerbally Pam indicated the water is treated with alum, precipitated and filtered, then chlorinated prior to distribution

Pam was very clear a contact need to be made with a Dr. David Spath at the DHS Redding office to get his approval prior to release of this additional data.

2) Analytical data from monitored wells. It is not clear whether DEH or DHS maintains this data, may need to contact both.

3) Water Quality Data collected on the Lake by DWR. Watermaster Ralph Howell collects samples for dissolved oxygen, pH, turbidity, secchi disc reading, phytoplankton, and MTBE from the lake. However, he does not maintain much of the results. Summary reports of this data will need to be obtained from Berry Montoya (916-653-4383) Operations and Maintenance, Water Quality Division of DWR in Sacramento. His boss is Jeff Janik. Will need to request water quality reports for the Upper Feather River Lakes, Lake Davis.

Miscellaneous Information

Received from Plumas County December 8, 1997

- 1) Letter dated December 3, 1997 from the Secretary for The Resources Agency of California to area Community Leaders concerning actions taken by the various state agencies.
- 2) A packet of letters and memoranda referred to by community members as "The Good Book" documenting interactions with various agencies.
- 3) Copy of EIR/EIS: Bruce McDowell obtained from Sacramento.

Attachment 4

**Recommended Ground water
Sampling Techniques by LLNL**

NEL Sampling notes

To: Bill Krigler

cc: Rita Scardaci
Fran Roudelbush
Leonard Marsh

Pages: 4

From: Tina Carlsen

RE: Sampling groundwater

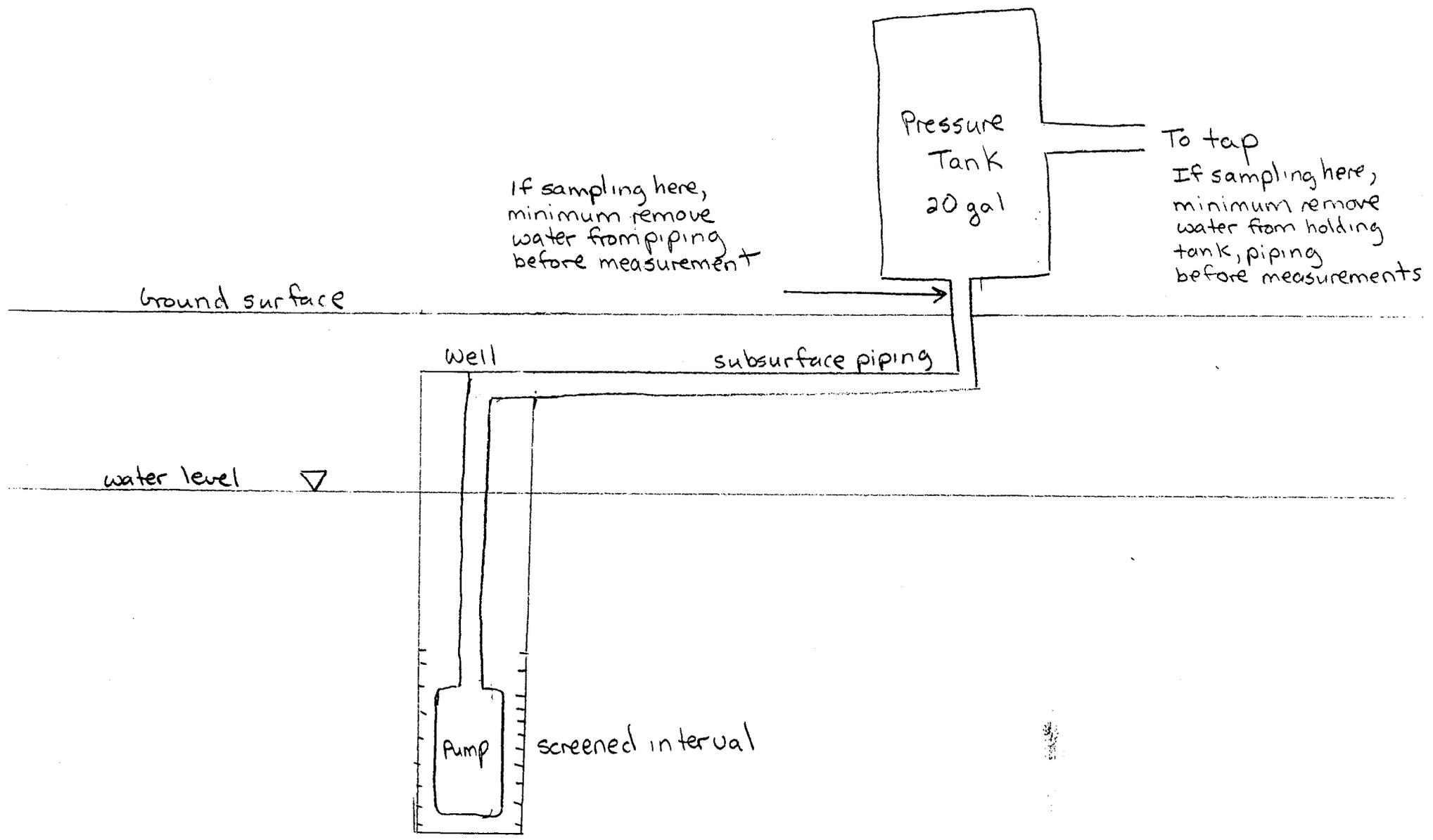
Date: 2/18/98

Bill-

In speaking with Leonard Marsh, my understanding of your typical well completion is shown attached.

I recommend sampling as close to "well head" as possible (see attached). I've also attached a recommended sampling log to be completed as much as possible for each well. I need to leave this afternoon, and won't be available until tomorrow pm. Will call you then.

Tina



If sampling here,
minimum remove
water from piping
before measurement

To tap
If sampling here,
minimum remove
water from holding
tank, piping
before measurements

Ground surface

water level ▽

Well

subsurface piping

Pressure
Tank
20 gal

Pump

screened interval

Well Sampling

Log

Date: _____

Sample ID: _____

Sampler: _____

Minimum volume of water

to remove (from Location Information) (gal): _____

Initial flow rate ($Q =$ gpm): _____
measured by bucket / flow meter / other

Time pump on: _____

Time pump off: _____

Time	Q	gal removed	pH	temp	Specific Conductance

Take these measurements after removing minimum volume.
Take at 2-3 minute intervals, minimum of 3 sets. Do not
collect samples until pH within 0.1 pH unit, temp. within 0.5°C
and specific conductance within 50 μ mhos/cm.

pH meter # _____ calibrated (Y/N)

SC meter # _____ calibrated (Y/N)

Samples collected:

Notes/Comments _____

Date: _____

Well Sampling Log

Sample ID: _____

Location Information

Location description _____

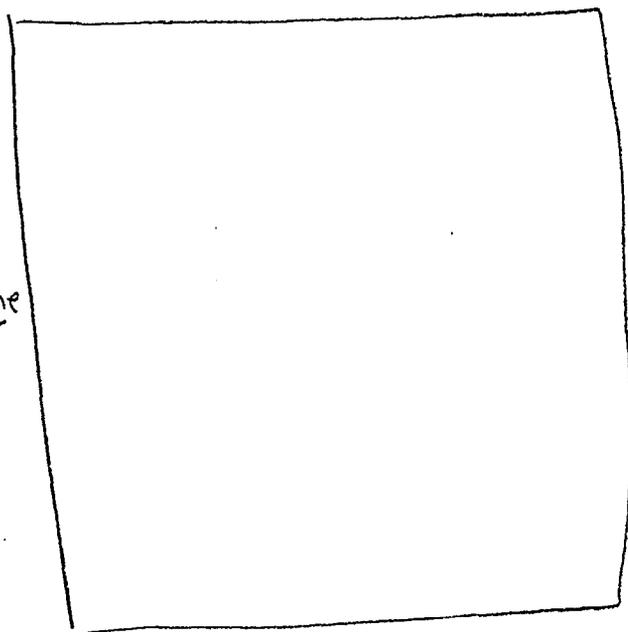
Depth to water (ft): _____ Point of measurement
Total depth of well (ft): _____ from ground surface (ft): _____

Height of water column (ft): _____ Casing ID (in): _____

Estimate of water in well casing (gal): _____ (height x volume factor)

Description of _____
Sampling location _____

Sketch of Sampling location



Water in holding tank (gal): _____

Subsurface piping:
length (ft): _____ ID (in): _____

Water in piping (gal): _____
length x volume factor

Minimum volume to remove -
dependent on sampling
location - (gal): _____

Volume factors

<u>ID (in)</u>	<u>Volume factor</u>
2	0.163
3	0.37
3.5	0.50
4	0.65
4.25	0.74
4.5	0.83
6	1.47
8	2.61
10	4.08

Notes / Comments: _____

Plumas County Davis Lake Well Sampling Project

Cindie Geddes

March 4, 1998

Copies to: Eileen Ferguson, Ph.D., Lab Manager
NEL Laboratories
Reno Division
1030 Matley Lane
Reno, NV 89502
(702) 348-2522
(702) 348-2546

Bill Crigler, R.E.H.S.
Plumas County Department of Environmental Health
270 County Hospital Road, Room 106
Quincy, CA 95971
(530) 283-6355
(530) 283-6241 fax

Pam Johnson, P.E.
State of California Department of Health Services
Drinking Water Field Operation Branch
Lassen District
415 Knollcrest Drive, Suite 110
Redding, CA 96002
(530) 224-4868
(530) 224-4844 fax

Valerie Dibley and Becky Goodrich
Lawrence Livermore
P.O. Box 808
Livermore, CA 94551-0808
(510) 422-1100

NOTES

- At the first home we went to (Brooke), the owner (Mrs. Brooke) was home and informed us that the water is on a filter system at both the accessible taps. A third tap is not filtered, but was inaccessible due to snow.
- At the second site (Takahashi, Grizzly Store), the well house was locked and therefore no taps were accessible.

- A series of subsequent phone calls from Leonard Marsh's home by Pam Johnson informed us that there were six sites (including the Marsh home) with accessible wells. It was decided among Bill Crigler, Cindie Geddes, Valerie Dibley, Becky Goodrich, and Pam Johnson that the most prudent course of action would be to sample only homes where the owner would be present. Future sampling would be done in this manner. Bill Crigler said he would write all the property owners requesting that they be home (date to be determined) during the sampling.

- The first site sampled was the Marsh residence (766 Grizzly Road). Mr. and Mrs. Marsh were at home at the time, and the house is a year-round residence. According to Mr. Marsh, the well is 105 feet deep with the pump set at 100 feet, with six inch diameter casing, and a holding tank of 25 gallons (Mr. Marsh estimated that there were only five gallons standing in the tank). The discharge line is 1 ¼ inch from the well to the pressure tank and one inch down the well. Samples were taken from a standard garden hose connected to a tap beneath the house. This tap is located at the side of the residence. Using a five gallon bucket, we estimated the flow from the hose to be approximately ten gallons per minute (gpm). The tap was run for over ten minutes before sampling to help ensure the water sampled was not that held in the holding tank. Sampling for VOC (Method 524 using three-40 mL bottles) and PB (Method 525 using four one-L bottles) was done by Cindie Geddes at 11:50 am.

- The next site sampled was the Parrish residence (no address given), which is also a year-round residence. However, the owner was not at home. She did, however, tell Pam Johnson where to find the spigot for the well, and assured us the water was not on a filter system. Samples were taken from the top metal spigot at the back of the house after running over 25 gallons. Using the bucket, we estimated flow to be approximately 7 gpm. Sampling for VOC and PB was done by Cindie Geddes at 12:45.

- Both Mr. and Mrs. Bishops (property owners of the year-round residence) were at home when we sampled the site at 6436 Lake Davis Drive. Mr. Bishops told us the well is 200 feet deep, with the pump set at 180 feet, with a six inch casing, and an 80 gallon pressure tank that runs from 10 to 12 gpm and is not on a filter system. Mr. Bishop ran the water for over 20 minutes before we arrived. Sampling for VOC and PB was done at 1:20 pm from a standard hose from the side of the house.

- Mr. Brown (3511 Grizzly Road) was home at his year-round residence when we sampled. According to Mr. Brown, his well is approximately 50 feet deep with no holding tank. Samples were taken from a standard garden hose behind the house, which runs to the well. Bucket estimation placed flow at approximately 4 gpm, and we let the water run for over five minutes before sampling began. Sampling for VOC and PB was done by Cindie Geddes at 2:10 pm.

Note: incorrect, spigot from middle of backyard as per VD TMC

- Our last site of the day was the Garcia residence (3561 Grizzly Road). Mr. Garcia (owner and year-round resident) told us the well is 86 feet deep. The water is filtered, but the filter system was bypassed for sampling. A 50 gallon tank (with an estimated 25 gallons of water) could not be bypassed. We ran off approximately 25 gallons before sampling from a metal spigot within the well house at the side of the residence. Sampling of VOC and PB was done by Cindie Geddes at 2:35 pm.

- Samples were dropped off and chains-of-custody signed over to Eileen Ferguson at approximately 4:00 pm.

Plumas County Davis Lake Well Sampling Project

Cindie Geddes

March 20, 1998

Copies to: Eileen Ferguson, Ph.D., Lab Manager
NEL Laboratories
Reno Division
1030 Matley Lane
Reno, NV 89502
(702) 348-2522
(702) 348-2546

Bill Crigler, R.E.H.S.
Plumas County Department of Environmental Health
270 County Hospital Road, Room 106
Quincy, CA 95971
(530) 283-6355
(530) 283-6241 fax

Pam Johnson, P.E.
State of California Department of Health Services
Drinking Water Field Operation Branch
Lassen District
415 Knollcrest Drive, Suite 110
Redding, CA 96002
(530) 224-4868
(530) 224-4844 fax

Valerie Dibley and Becky Goodrich
Lawrence Livermore
P.O. Box 808
Livermore, CA 94551-0808
(510) 422-1100

NOTES

- Lake Davis Cabins: The owner (Anthony Olsen) was present. The cabins have not been used consistently this winter. The well is 125 feet deep with a 2 inch pipe and a 10 gallon holding tank. The pump is at about 100 feet, and there is no filter system. One of the cabins is kept at a slow drip to keep the pipes from freezing. Samples were taken at the side of the 'Buck' cabin. Using a five gallon bucket, we estimated the flow from the metal spigot to be approximately 20 gallons per minute (gpm). The tap was run for nearly 20 minutes before sampling to help ensure the water sampled was not that held in the holding tank. Sampling for

VOC (Method 524 using three-40 mL bottles) and PB (Method 525 using four one-L bottles) was done by Cindie Geddes at 10:05 am.

- **The Grizzly Store:** David and Mary Takahashi (owners) were present. The store has been closed for winter, and no water has been available for over a month (economic setbacks precluded the use of electricity to run the pump). The Takahashis have been getting water from a neighbor. Mrs. Takahashi turned the pump on for the purpose of testing. The well is 180 feet deep with a 250 gallon holding tank. There is no filter system. I was unable to measure the flow due to the awkward positioning of the pipe (metal spigot, wrapped piping), but it appeared to be similar to the Olsen site (20 gpm) which was only a few hundred feet uphill. Samples were taken by Cindie Geddes at 10:40 am after running the water for over 15 minutes.
- **7735 Whitethorn Trail (Correll Residence):** Brenda Correll was at home and showed me to the well house behind her fifth wheel residence. The well is 396 feet with a 6 inch casing to 65 feet, 4 inch below, with an 80 gallon holding tank. Water was taken from a typical garden hose connected to the metal spigot. Using the 5 gallon bucket, the water was measured at approximately 5 gpm. The water flowed for over 20 minutes before sampling was performed by Cindie Geddes at 11:40. Mrs. Correll is also interested in minerals testing at her home and was advised to call Bill Criggler.
- **2130 Grizzly Road (Falkenstrom Residence):** Dan Barrett (neighbor) showed me to the spigot beside the holding tank under the front of the residence. We saw no filter near the spigot, and Mr. Barrett said he doesn't think there is one at all. We estimated the holding tank to be about 80 gallons at the most and emptied 100 gallons to be on the safe side. The well is 140 feet deep, and Mr. Barrett said he thought the pump was at about 120 or 130 feet (just like his). Samples were taken by Cindie Geddes at 1:12 pm from the metal spigot.
- **3427 Chipmunk Lane (Bullard Residence):** Roy Bullard (resident) showed me to the well house beside the garage where samples were taken from some copper tubing (approximately five inches long) connected to a metal spigot beside the holding tank. The well is 90 feet deep with the pump at 40 feet, and a 40 gallon holding tank with no filter. 50 gallons of water were emptied before samples were taken by Cindie Geddes at 12:40.
- **3790 Grizzly Road (Marquez Residence):** Mrs. Marquez led me to a metal spigot at the side of the house. Her husband had showed her how to bypass the filter system, but as we began to let the water run, the water flow slowed and eventually stopped. No samples were taken, and Mrs. Marquez was advised to call Bill Criggler and get back on the list for the next sampling time. In the meantime, she would get further instruction on how to bypass the filter system.

Plumas County Davis Lake Well Sampling Project

Cindie Geddes

March 24, 1998

**Copies to: Eileen Ferguson, Ph.D., Lab Manager
NEL Laboratories
Reno Division
1030 Matley Lane
Reno, NV 89502
(702) 348-2522
(702) 348-2546**

**Bill Crigler, R.E.H.S.
Plumas County Department of Environmental Health
270 County Hospital Road, Room 106
Quincy, CA 95971
(530) 283-6355
(530) 283-6241 fax**

**Pam Johnson, P.E.
State of California Department of Health Services
Drinking Water Field Operation Branch
Lassen District
415 Knollcrest Drive, Suite 110
Redding, CA 96002
(530) 224-4868
(530) 224-4844 fax**

**Valerie Dibley and Becky Goodrich
Lawrence Livermore
P.O. Box 808
Livermore, CA 94551-0808
(510) 422-1100**

NOTES

- **7797 Buckbrush (Cooper Residence):** The owner (Bruce Cooper) was present. The residence has been used throughout this winter. The well is 230 feet deep with an 86 gallon holding tank. The pump is at about 200 feet, and there is no filter system. Samples were taken from the plastic faucet at the sink in the garage. Using a five gallon bucket, I estimated the flow to be approximately 2.5 gallons per minute (gpm). I ran this tap, as well as an outside spigot (estimate at 15 gpm) for nearly 15 minutes before sampling to help ensure the water sampled was not that held in the holding tank. Sampling for VOC (Method 524 using three-

40 mL bottles) and PB (Method 525 using four one-L bottles) was done by Cindie Geddes at 9:23 am.

- 1845 Grizzly Road (Sanders Residence): Richard Sanders (future owner) was at home during the sampling, but didn't have any information about his well. The house is used year-round.

Mr. Sanders estimated his holding tank to be about 80 gallons. There is no filter system. I measured flow to be approximately 8 gpm and let the water run for over 10 minutes before sampling from a metal spigot at the side of the house. Samples were taken by Cindie Geddes at 10:00 am.

- 2895 Grizzly Road (Owned by Earl Thompson): The tenants, Mark and Lynda Lowe were present at the time and showed me to the well house at the side of the year-round residence. The well is estimated to be about 100 feet deep with a 300 gallon holding tank with no filter. Water was taken from a metal spigot beside the door to the well house. I measured flow to be approximately 20 gpm and ran the water for 15 minutes before sampling. Sampling was performed by Cindie Geddes at 10:45.

- 5031 A Grizzly Road (Barrett Residence): Mrs. Barrett showed me to the metal spigot at the front of the garage. The well is 120 feet deep with an estimated 100 gallon holding tank. No filter system is used. I measured flow to be approximately 10 gpm and ran the water for 10 minutes before sampling. Samples were taken by Cindie Geddes at 11:16.

- 1924 Grizzly Road (Ulrich Residence): Mrs. Ulrich showed me to a metal spigot at the side of the house. The well is 204 feet deep with the pump set at about 160 feet and has an 80 gallon holding tank. No filter system is in place. I estimated flow to be approximately 20 gpm and let the water flow for 5 minutes. Samples were taken by Cindie Geddes at 11:40.

Samples were signed over to Evelyn Snell at NEL at approximately 1:30 pm.

Plumas County Davis Lake Well Sampling Project

Cindie Geddes

May 1, 1998

Copies to: Eileen Ferguson, Ph.D., Lab Manager
NEL Laboratories
Reno Division
1030 Matley Lane
Reno, NV 89502
(702) 348-2522
(702) 348-2546

Bill Crigler, R.E.H.S.
Plumas County Department of Environmental Health
270 County Hospital Road, Room 106
Quincy, CA 95971
(530) 283-6355
(530) 283-6241 fax

Pam Johnson, P.E.
State of California Department of Health Services
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415 Knollcrest Drive, Suite 110
Redding, CA 96002
(530) 224-4868
(530) 224-4844 fax

Valerie Dibley and Becky Goodrich
Lawrence Livermore
P.O. Box 808
Livermore, CA 94551-0808
(510) 422-1100

NOTES

•The following table represents my notes from April 27 and April 29 on the well sampling at Davis Lake.

Thanks,
Cindie Geddes

Address	Sample Date/Time	Sample Site	Well Depth (feet)	Pump Depth (feet)	Holding Tank Size (gallons)	Filter	Type of Residence	Flow (gpm)	Amount of Time Water Flowed Before Sampling	Notes
7957 Buckbrush	4-27-98/ 10:19	metal spigot at well house uphill from cabin	385-390	almost at bottom	estimate 80-85	no	seasonal cabin	5	1 hour 4 minutes prior to my arrival	tank bled last on Jan. 5
7322 Marilyn	4-27-98/ 10:42	metal spigot west of and behind trailer	133	at bottom	none	no	seasonal camp-like site	not measured	two minutes	water appeared brown and bubbly
7350 Lakeview	4-27-98/ 11:30	plastic laundry room sink with metal spigot	500	unknown	estimate 120	no	cabin, used off and on all year	4	25 minutes	
7292 Marilyn	4-27-98/ noon	metal spigot at back of house	unknown	unknown	estimate 80-100	not that I could see	cabin, assume seasonal	5	20 minutes	no one home
6354 Lake Davis	4-27-98/ 12:15	rubber hose from well house	100	80	120	no	camp-like site, appeared seasonal	not measured	2 hours	Bishops led me to site while owner was in meeting
3185 Fawn	4-27-98/ 13:55	stand alone metal spigot next to electric box	unknown	unknown	unknown	not that I could see	camp-like site, appeared seasonal	10	10 minutes	no one on site but a construction worker (George Daferno) who was working on garage

Address	Sample Date/Time	Sample Site	Well Depth (feet)	Pump Depth (feet)	Holding Tank Size (gallons)	Filter	Type of Residence	Flow (gpm)	Amount of Time Water Flowed Before Sampling	Notes
3311 Fawn	4-27-98/ 14:20	metal spigot at side of well house	85	80	estimate 40	no	year round cabin	5	9 minutes	owner says the water is hard
3251 Fawn	4-27-98/ 14:45	metal spigot at side of house	130	110	120	no	year round cabin	8	15 minutes	owner says the water is hard
9090 Marilyn	4-27-98/ 15:35	pvc pipe on knoll past shed on right	200	close to bottom	none	no	seasonal camp-like site	not measured	2 minutes	
Sleepy Hollow Trailer Court	4-27-98/ 16:40	metal spigot at space #38	70	unknown	5,002	no	camp trailer park	not measured	5 minutes	pipe in use for the last month John Shearer, Manager
8150 Marilyn	not sampled									snow made site inaccessible
7299 Canyon	not sampled									no one home, couldn't be sure which site was 7299, tried several
2927 Grizzly	not sampled									water ran from spigot at side of house for about a minute, then petered out

Address	Sample Date/Time	Sample Site	Well Depth (feet)	Pump Depth (feet)	Holding Tank Size (gallons)	Filter	Type of Residence	Flow (gpm)	Amount of Time Water Flowed Before Sampling	Notes
7110 Davis Lake	4-29-98/ 9:00	metal spigot in well house	274	160	50	no	seasonal cabin	8	10 minutes before I got there	
7985 Buckbrush	4-29-98/ 9:18	metal spigot beside well house	unknown	unknown	50	no	seasonal camp-like site	8	8 minutes	Ed Heidt showed me to the site
58 Pinehaven	4-29-98/ 9:35	plastic sink in well house	200	180	80	no	year round camp-like site	3	20 minutes	
7819 Whitethorn	4-29-98/ 9:58	metal spigot next to electrical box	430	at least 400	60	no	seasonal, camp-like site	20	5 minutes	
7286 Marilyn	4-29-98/ 10:20	big metal pipe at well	140	120	80	no	seasonal cabin	10	8 minutes	sampled directly at well before the water reaches the holding tank, water brownish
7330 Marilyn	4-29-98/ 10:38	metal spigot nearest road	300	260	220	no	seasonal cabin	10	30 minutes before I got there	
7294 Canyon	4-29-98/ 11:05	metal spigot in front and to the left of trailer	60	unknown	none, 10 gal pressure tank	no	seasonal camp-like site	8	15 minutes before I got there	water brownish

Address	Sample Date/Time	Sample Site	Well Depth (feet)	Pump Depth (feet)	Holding Tank Size (gallons)	Filter	Type of Residence	Flow (gpm)	Amount of Time Water Flowed Before Sampling	Notes
7295 Canyon	4-29-98/ 11:22	metal spigot left of well house	210	195	80	no	seasonal camp-like site	16	30 minutes before i got there	water bubbly
8060 Buckbrush	4-29-98/ 11:45	metal spigot beside house	355	345	90	no	seasonal cabin	8	2 hours before I got there	
1708 Valley View	4-29-98/ 12:40	metal spigot in laundry room (between filter and washing machine)	550	unknown	30	yes, but removed for sampling	year round cabin	4.5	8	
1937 Grizzly	4-29-98/ 13:10	metal spigot next to shed	60-70	40-45	50	no	year round cabin	10	5 minutes	
3225 Fawn	4-29-98/ 13:28	metal spigot uphill from house	150	50	estimate 80-100	yes, many filters, but bypassed	off and on year round cabin	20	5 minutes	took sample at a spigot close to well, before filter systems
175 DePersia	4-29-98/ 14:55	plastic sink in garage	200	160	90	no	year round cabin	7	15 minutes	

1460 Lander Street
Reno, NV 89509

CINDIE GEDDES

Home: (702) 322-1445
Office: (702) 747-5777

Plumas County Davis Lake Well Sampling Project

Cindie Geddes

June 30, 1998

Copies to: Eileen Ferguson, Ph.D., Lab Manager
NEL Laboratories
Reno Division
1030 Matley Lane
Reno, NV 89502
(702) 348-2522
(702) 348-2546

Bill Crigler, R.E.H.S.
Plumas County Department of Environmental Health
270 County Hospital Road, Room 106
Quincy, CA 95971
(530) 283-6355
(530) 283-6241 fax

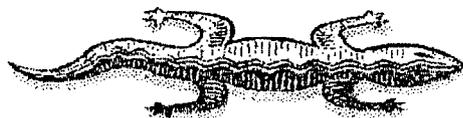
Pam Johnson, P.E.
State of California Department of Health Services
Drinking Water Field Operation Branch
Lassen District
415 Knollcrest Drive, Suite 110
Redding, CA 96002
(530) 224-4868
(530) 224-4844 fax

Valerie Dibley and Becky Goodrich
Lawrence Livermore
P.O. Box 808
Livermore, CA 94551-0808
(510) 422-1100

NOTES

- The following table represents my notes from June 29 on the well sampling at Davis Lake.

Thanks,
Cindie Geddes



Address	Sample Date/Time	Sample Site	Well Depth (feet)	Pump Depth (feet)	Holding Tank Size (gallons)	Filter	Type of Residence	Flow (gpm)	Amount of Time Water Flowed Before Sampling	Notes
7791 Whitethorn	6-29-98/ 10:45	garden hose connected to metal spigot behind trailer	?	?	assumed 100	none apparent	seasonal camp-like site	5	20 minutes	resident not home, but left note on door saying the water was on at the spigot
Canyon Drive and Davis Way	6-29-98/ 11:30	metal spigot at well head below windmill	140	130-135	none	none	seasonal camp-like site	not measured	five minutes	
7308 Davis Way	6-29-98/ 11:55	metal spigot beside well house which owner says bypasses holding tank	125	117	25	none	seasonal camp-like site	10	five minutes	
5865 Bitterbrush	6-29-98/ 14:00	metal spigot at back of house	300	unknown	estimated 120	none	seasonal cabin	5	25 minutes	
7344 Sharon Way	6-29-98/ 14:20	metal spigot at side of well house	245	230	40	none	seasonal camp-like site	10	five minutes	
3119 Grizzly	6-29-98/ 15:40	metal spigot up a few stairs from well house	119	119	two tanks estimated at 120	none	seasonal cabin	10	25	

Address	Sample Date/Time	Sample Site	Well Depth (feet)	Pump Depth (feet)	Holding Tank Size (gallons)	Filter	Type of Residence	Flow (gpm)	Amount of Time Water Flowed Before Sampling	Notes
3597 Grizzly	6-29-98/ 16:40	metal spigot beside trailer	70	unknown	estimated 120	none	seasonal trailer	20	six minutes	

7271 Canyon, 7272 Lake Davis Road (there does not appear to be such an address, but I assumed it was actually 7272 Canyon because 7271 Canyon was right across the way and a sign said 7272 on this site), and 5612 Grizzly were not sampled because no one was home.

Willow Way was not sampled because I could not find Willow Way.

7344 Sharon Way (Noah and Elissa Miller 832-59323) was added by request of the residents and with approval by Julie Dykes.

Attachment 5

**NEL Laboratories Assessment
by LLNL**

ENVIRONMENTAL RESTORATION DIVISION

August 24, 1998

TO: Tina Carlsen
FROM: Valerie Dibley and Becky Goodrich
SUBJECT: NEL Laboratories Assessment

NEL Laboratories is an analytical laboratory located in Reno, Nevada. NEL will be performing the chemical analyses for Plumas County's Lake Davis. Because NEL will perform EPA methods 524.2 (standard list of analytes) and 525.2 (piperonyl butoxide only), we restricted our assessment of the laboratory to drinking water organics. A California Department of Health Services Certification was valid for these analyses.

In general the laboratory's front entrance appeared secure (visitors must sign in and out) and workspaces seemed clean and organized. The laboratory has a Quality Assurance and Quality Control Plan and Standard Operating Procedures for laboratory operations. These documents are not formally controlled, but are updated personally by the QA Manager. The SOPs are available in the laboratories.

Personnel training records and job descriptions are stored in the QA Manager's Office. Formal education, resumes, and date and duration of specific training for methods being performed is documented for each analyst. Internal QA assessments are performed every three months or sooner if a specific problem arises. Non-conformances and corrective actions are documented on a Corrective Action Report which states the problem, cause and correction. These reports can be correlated to the internal QA assessment. Analysts partake in performance evaluations every six months by single and double blind samples being run through the facility.

The NEL SOPs for the analysis of 524.2 and 525.2 were reviewed. The NEL procedure follows EPA protocol. The specific methods are posted in each laboratory. NEL has one GC/MS for volatiles and one for semivolatiles. The drinking water GCMS auto-sampler samples VOA vials directly. The glassware used for drinking water analyses is dedicated and the laboratory is positively pressured and to prevent contamination. The QC sample analysis frequency and acceptance criteria are described in the SOP and posted in the laboratory. When QC falls outside of acceptance limits, a Corrective Action Report is completed. MDL determination procedures are described in NEL SOP4004. Run logs are maintained by printing out the computerized sample sequence and filing in a three-ring binder by date. Data is reduced by hand and peer reviewed by the QA Manager or the Laboratory Manger.

Sample receipt and handling are documented in an SOP. Samples are received at the front desk and logged into a logbook and the LIMS system. The condition of samples is noted on the COC. Samples are tracked in and out of refrigerators using an in-house COC. Refrigerators are checked every working day and logged. Thermometers are calibrated against an NIST thermometer. Temperature excursion corrective actions are described at the bottom of the log. The drinking water samples are stored separately from other samples

in the GC/MS room. Sample holding and turnaround times are monitored using a tabulated backlog that is reviewed every morning.

Standards are tracked in a standards preparation logbook. Standards are stored in separate refrigerator away from samples. Standards are traceable to NIST where possible. Standards were labeled with concentration, date of preparation, and the identity of the preparer. Initial calibrations are performed every six months. Calibrations are verified using a CCV prepared from a different source than the initial calibration standards. The standard refrigerator contents were reviewed and no expired standards were found. Calibration procedures are documented in an SOP.

Analytical balances are currently within calibration and labeled with the calibration date and calibrator's initials. A logbook indicating the last date of calibration and calibration due date is maintained in the QA office. The balances are checked daily against 0.10g, 30g and 300g weights. The weights are calibrated annually to NIST standards. Hamilton Syringes do not undergo calibration, but pipettes used in metals analyses are calibrated on the balance in the metals area of NEL.

Analytic reports are stored in an archival area upstairs. The hard copies are archived according to instrument used, client and chronological order. A logbook showing retrieval of records is maintained by the QA Manager and stored in the QA office. Tapes and CDs are stored in the QA office and usage is tracked and documented in a logbook.

Attachment 6

**Letter from Plumas County to CDFG commenting
on Draft Memorandum of Agreement
between CDFG and Plumas County for
NEL Laboratories Services for Lake Davis
water and sediment samples**

DEPARTMENT OF PUBLIC WORKS

1834 EAST MAIN, QUINCY, CA 95971 TELEPHONE (916) 283-6268 FAX 283-6323



MEMORANDUM

DATE: June 1, 1998

TO: Nancee Murray
Department of Fish and Game

FROM: Tom Hunter, Director
Plumas County Department of Public Works

Fran Roudebush
Plumas County Supervisor

RE: MOA FG 7560 R2 - NEL

TOM HUNTER
DIRECTOR

RICHARD HUMPHREY
DEPUTY DIRECTOR OF PUBLIC WORKS

MARTIN BYRNE
ASST. DIRECTOR OF PUBLIC WORKS

Since receiving this document, we have discussed it at the Lake Davis Task Force Meeting on Monday night, May 18, 1998, and with Tina Carlsen, Ph.D., Lawrence Livermore National Laboratory. Members of the Task Force include Plumas County Officials, Dr. David Spath with DHS, City of Portola Officials and Nick Villa, California Department of Fish and Game (Mr. Villa is there to listen and observe), Tina Carlsen, Ph.D. of Lawrence Livermore National Laboratory via conference call.

This document was also addressed and voted on at the Plumas County Board of Supervisors Meeting on Tuesday May 19, 1998. There are numerous changes that need to be addressed.

Page 2, Item C:

While we understand your need to outline efforts you feel were needed to protect the community we hope you will understand our need to be perfectly clear on what testing has been done so far. While water and sediment samples collected from Lake Davis have been tested on a regular basis by the Department and the California Department of Health Services **not all constituents used to chemically treat the lake have been tested for in the sediment. Most of the chemical compounds have dissipated in the water, at this time. The County wishes to have sediment samples from Lake Davis tested by an independent laboratory of their choice for all constituents used in the chemical treatment. This has been agreed to by the Department of Health Services and the Department until three (3) continuous rounds of testing have shown non-detectable levels of all constituents used in the chemical treatment at all ten (10) test sites. These test sites are the same sites used for the testing of the water. When all chemicals have reached a non-detectable level in the sediment, the County wishes to have water samples from Lake Davis tested by an independent laboratory of their choice, as well. This has also been agreed to by both the Department and DHS.**

Page 2, Item D:

We do not know if this testing will even begin before June 30, 1998. I assume that your intent is to keep the costs within the fiscal year. The term of the MOA should be extended. The term should end after the completion of the specified testing.

Page 3, Item E:

We currently have a Memorandum of Agreement with NEL for specific rates for specific tests. I assume that this would suffice. I would like to see the required verbage regarding the state auditor examination.

COPY

Page 4, Item B:

The third line references a "20-ml" glass vial. Tina knows that this should be 40-ml and should be done in triplicate.

The second to last sentence refers to "field blanks". Tina feels that field blanks are nebulous, but trip blanks may be appropriate.

Page II 4, Item D:

I have attached a copy of the deliverables that are currently required of NEL. These same criteria should be referenced to in the agreement.

In addition, Gunther Strum is spelled Sturm. Bill Crigler, Plumas County Environmental Health (Fax: 530-283-6241) should be added to the notification list.

Page 4, Item III A:

I am concerned that this document does not give any leeway in the dollar amount. The specifications do reflect the present costs for the specified tests. However, if any tests need to be retaken or enhanced, there are no terms to extend these terms and dollar value.

Page 6, 4A, Reimbursement:

The Department shall make disbursements to the County for expenditures incurred pursuant to this MOA as provided for in paragraph two, Sections B.2, B.3, and B.4. The Department will make reimbursement to the County within 30 days of receipt of invoices.

If payment is not received within 30 days, the County reserves the right to charge the Department 10% interest per month on overdue claims.

Page 6, Item V A:

Tina has stated that method 8260A should be 8260A-5035. This has already been fully discussed with DHS and should clarify this method (Items 1 and 2B).

Shouldn't there be a method defined for extraction of the samples?

Item 2c should state:

(c) Rotenone using Department of Fish and Game or DHS approved HPLC method (based on Dawson, et al, 1983) for water and sediment, and;

Item 2d - add:

"for water" after 525.2 for clarification.

Page 7, Detection Limits:

The last column has a few changes:

ug/g should be ug/kg
30 should be 10
70 should be 50

Last comment--at the Task Force Meeting on Monday night, Dr. Spath said NEL doesn't have the chemicals to set the standard for rotenylone testing. DHS will share the synthetic chemicals they have available with NEL for testing. If so, the cost parameters will change.

Please address each of these comments. Fran Roudebush has been authorized to sign the document when it is in final form.

If you have any questions, please contact myself, Bill Crigler, or Fran Roudebush.

cc Bill Crigler
Rita Scardaci, Plumas County Health Services
Tina Carlsen, Lawrence Livermore National Lab ✓
Plumas County Counsel

Attachment 7

**LLNL Memos to DHS and NEL outlining
Performance Evaluation samples**

**Performance Evaluation sample
certifications from
Environmental Resource Associates**

Date: May 27, 1998
 To: Bill Draper, DHS
 Jason Geddes, NEL
 From: Tina Carlsen, LLNL
 Subject: Performance Evaluation Samples

Here is a list of the performance evaluation samples you will receive, constituent analytes, expected reporting limits, and suggested analytical method as I currently understand them to be in the California Department of Fish and Game's Memorandum of Agreement (MOA) with Plumas County for independent laboratory testing.

Samples to be sent to both DHS and NEL:

Sample/matrix	Constituent analytes	Expected Reporting limits	Suggested analytical method ^a	Sample originator ^b
VOCs in water (three 40 mL VOA vials, preserved with HCL)	Trichloroethylene	0.5 µg/L	EPA 502.2 or	ERA
	Naphthalene	0.5 µg/L ^c	EPA 524	
	m-xylene ^c	0.5 µg/L	"	
	o-xylene ^c	0.5 µg/L	"	
	p-xylene ^c	0.5 µg/L	"	
Semi-volatile VOCs in water (one 1 L bottle)	Naphthalene	2 µg/L	EPA 8310 or	ERA
	1-methyl-naphthalene ^d	2 µg/L	EPA 525	
	2-methyl-naphthalene ^d	2 µg/L	"	
Rotenone in water (one 1 L bottle)	Rotenone	2 µg/L	CDFG or DHS HPLC method	LLNL
Piperonyl Butoxide in water (one 1 L bottle)	Piperonyl Butoxide	2 µg/L	EPA 525.2	LLNL
Rotenone/Piperonyl Butoxide in sediment (500 g in 950 mL jar)	Rotenone	30 µg/kg ^e	CDFG or DHS HPLC method	LLNL
	Piperonyl Butoxide	50 µg/kg ^e		

- a Please indicate which method was used, or if an alternate was used.
- b Samples from ERA (Environmental Research Associates) and LLNL (Lawrence Livermore National Laboratory) will be sent directly to the laboratory from either LLNL or ERA via overnight express on Thursday, May 28, 1998. Samples should arrive at the laboratory Friday (May 29) morning.
- c Although the CDFG MOA specifies a 2 µg/L reporting limit, this PE sample was prepared for an expected 0.5 µg/L reporting limit.
- c PE samples were prepared using all three separate isomers. Please indicate if results are for combinations of isomers.
- d PE samples were prepared using two separate isomers. Please indicate which isomer is reported.
- e Please indicate if results are reported as wet or dry weight. If reporting wet weight, please report water content.

Samples to be sent to NEL only:

Sample/matrix	Constituent analytes	Expected Reporting limits	Suggested analytical method ^a	Sample originator ^b
VOCs in sediment (one 40 mL VOA vial with 60 g)	Trichloroethylene	5 µg/Kg ^f	EPA 8260/	ERA
	Naphthalene	5 µg/Kg ^f	5030	
	m-xylene ^c	5 µg/Kg ^f	"	
	o-xylene ^c	5 µg/Kg ^f	"	
	p-xylene ^c	5 µg/Kg ^f	"	
Semi-volatile VOCs in sediment (one jar with 250 g)	Naphthalene ^d	100 µg/Kg ^f	EPA 8270	ERA
	1-methyl- naphthalene ^e	100 µg/Kg ^f	"	
	2-methyl- naphthalene ^e	100 µg/Kg ^f	"	

a Please indicate which method was used, or if an alternate was used

b Samples from ERA (Environmental Research Associates) will be sent directly to the laboratory from ERA via overnight express on Thursday, May 28, 1998. Samples should arrive at the laboratory Friday (May 29) morning.

c PE samples were prepared using all three separate isomers. Please indicate if results are for combinations of isomers.

d The CDFG contract specifies a 6 µg/Kg detection limit for naphthalene in sediments. This will come from the VOC analysis. This PE sample was prepared assuming a 100 µg/Kg detection limit. Naphthalene will not be included in future semiVOC in sediment PE samples.

e PE samples were prepared using two separate isomers. Please indicate which isomer is reported.

f Please indicate if results are reported as wet or dry weight. If reporting wet weight, please report water content if possible.

Note to Bill: I understand your laboratory is not set up to do the methylnaphthalene isomers in water. I apologize for sending you samples you cannot analyze. I will not include your lab for the methylnaphthalene isomers in the final lake/sediment sampling round.

Note to Jason: I understand your laboratory has not completed the method development work for Rotenone and Piperonyl Butoxide in sediments, pending receipt of a contract. Thus, these PE samples may become part of the method development.

Thank you for your tolerance with this, it has not been easy figuring out the direction CDFG wishes to take. Although it may seem like we are jumping the gun on these PE samples, please look at this as a way to work out any remaining bugs/issues prior to the final lake and sediment sampling. Dr. Perera of DHS gets the credit for suggesting a round of PE samples prior to the final lake/sediment sampling. This would have been doubly painful were we trying to do this the day before that major sampling. Obviously I would like to get some preliminary precision data between the two labs (which was my point in wanting PE samples), but that may not happen until the final set of PE samples are submitted with the lake and sediment samples.

CC: Dr. David Spath, DHS

Date: June 5, 1998
 To: Bill Draper, DHS
 Jason Geddes, NEL
 From: Tina Carlsen, LLNL
 Subject: Performance Evaluation Samples for final Lake Davis Verification Sampling

Here is a list of the performance evaluation samples you will receive, constituent analytes, expected reporting limits, and suggested analytical method for the final verification sampling of the Lake Davis water and sediment. PE samples from LLNL will be delivered to the sampling site at Lake Davis the day of the sampling by LLNL chemist Gene Kumamoto. These PE samples will be included on the chain-of-custody with the lake water and sediment samples. The VOC and semi-VOC samples will be sent directly to your laboratory by ERA. These PE samples should be analyzed in the same batch as the Lake Davis water and sediment samples. We are currently planning to have ERA prepare the samples on Tuesday, June 9, to arrive at your laboratory June 10. Should the final lake water and sediment sampling verification sampling be delayed, we will delay the preparation of the PE samples. I will be on travel the entire week of June 8. Gene Kumamoto (925-422-8128) can answer any question on the PE samples in my absence.

Samples to be sent to both DHS and NEL:

Sample/matrix	Constituent analytes	Expected Reporting limits	Suggested analytical method ^a	Sample originator ^b (Sample ID)
VOCs in water (three 40 mL VOA vials, preserved with HCL)	Trichloroethylene	0.5 µg/L	EPA 502.2 or	ERA
	Naphthalene	0.5 µg/L	EPA 524	
	m-xylene ^c	0.5 µg/L	"	
	o-xylene ^c	0.5 µg/L	"	
	p-xylene ^c	0.5 µg/L	"	
Rotenone in water (one 1 L bottle)	Rotenone	2 µg/L	CDFG or DHS HPLC method	LLNL (PE-1)
Piperonyl Butoxide in water (one 1 L bottle)	Piperonyl Butoxide	2 µg/L	EPA 525.2	LLNL (PE-2)
Rotenone/Piperonyl Butoxide in sediment (500 g in 950 mL jar)	Rotenone	30 µg/kg ^e	CDFG or DHS HPLC method	LLNL (PE-3)
	Piperonyl Butoxide	50 µg/kg ^e	EPA 8270	

- a Please indicate which method was used, or if an alternate was used.
 b ERA=Environmental Research Associates; LLNL=Lawrence Livermore National Laboratory
 c PE samples were prepared using all three separate isomers. Please indicate if results are for combinations of isomers.
 d PE samples were prepared using two separate isomers. Please indicate which isomer is reported.
 e Please indicate if results are reported as wet or dry weight. If reporting wet weight, please report water content.

Samples to be sent to NEL only:

Sample/matrix	Constituent analytes	Expected Reporting limits	Suggested analytical method ^a	Sample originator ^b
VOCs in sediment (concentrate and sand blank matrix)	Trichloroethylene	5 µg/Kg ^e	EPA 8260/	ERA
	Naphthalene	5 µg/Kg ^e	5030	
	m-xylene ^c	5 µg/Kg ^e	"	
	o-xylene ^c	5 µg/Kg ^e	"	
	p-xylene ^c	5 µg/Kg ^e	"	
Semi-volatile VOCs in water (one 1 L bottle)	1-methyl-naphthalene ^d	2 µg/L	EPA 8310 or EPA 525	ERA
	2-methyl-naphthalene ^d	2 µg/L	"	
Semi-volatile VOCs in sediment (one jar with 250 g)	1-methyl-naphthalene ^d	100 µg/Kg ^e	EPA 8270	ERA
	2-methyl-naphthalene ^d	100 µg/Kg ^e	"	

a Please indicate which method was used, or if an alternate was used

b ERA=Environmental Research Associates; LLNL=Lawrence Livermore National Laboratory

c PE samples were prepared using all three separate isomers. Please indicate if results are for combinations of isomers.

d PE samples were prepared using two separate isomers. Please indicate which isomer is reported.

e Please indicate if results are reported as wet or dry weight. If reporting wet weight, please report water content if possible.

Note to Jason: The VOC in sediment sample will be different than the one sent to you during the first round of PE samples. To eliminate concerns with heterogeneity of native soil samples, this PE sample will come to you as a concentrate to be added to a sand matrix (also included). Specific instructions on how to process this sample will be included from ERA.

Good luck with the verification analysis, lets keep our fingers crossed.

CC:

Dr. David Spath, DHS

Gene Kumamoto, LLNL



**ENVIRONMENTAL
RESOURCE ASSOCIATES**

June 5, 1998

Tina Carlson
Lawrence Livermore National Lab
7000 East Ave., L-544
Livermore, CA 94550

FAX: 925-423-5764

Dear Tina:

Enclosed you will find the certification sheets for the single blind Performance Evaluation standards sent to Bill Draper at California Department of Health Services and Jason Geddes at Nevada Environmental Laboratory on 5/28/98. Please refer to ERA project # 0522-98-05 for any future inquiries.

As discussed on 6/4/98 in our phone conversation, the volatiles in soil certification sheet does not contain the concentration of the individual xylene isomers, just the total xylenes certified value. It also has come to our attention that the volatiles in soil whole volume sample that was sent may be a nonhomogeneous sample. The production of this product has temporarily been suspended until the technical issues can be resolved. ERA will not charge for this product and could supply, at no additional charge, a single blind Custom Volatiles in Soil (Cat. # 093 Concentrate & Blank Matrix) as a replacement.

As a result the volatiles in soil whole volume sample quoted for Quotation # 0603-98B is not available at this time. This could be replaced with a single blind Custom Volatiles in Soil (Cat. # 093 Concentrate & Blank Matrix). I would like to apologize for any inconvenience that these problems may have caused.

If you have any questions, please feel free to call me at the toll-free number 1-800-372-0122.

Sincerely,

A handwritten signature in black ink, appearing to read "M. E. Blades", written in a cursive style.

Michael E. Blades
Chemist

Enclosures



Certification

LLNL

Quality Control Standards

Catalog N° 093

Lot N° 0522-98-05

Custom Standard

Volatiles in Water

<u>Parameter</u>	<u>Certified Value</u> <u>(ug/L)</u>	<u>Performance</u> <u>Acceptance Limits™</u> <u>(ug/L)</u>
Naphthalene	1.01	NA
Trichloroethylene	1.07	0.797-1.30
m-Xylene	1.01	0.652-1.27
o-Xylene	1.08	0.697-1.36
p-Xylene	1.03	0.666-1.30

Standard Preparation Instructions: None required. The standard is ready for preparation and analysis as received.

Preservative: HCL.

Storage: Store at 4°C.

NA - Performance Acceptance Limits™ not currently available.

Performance Acceptance Limits (PALs™) are listed as guidelines for acceptable analytical results given the limitations of the USEPA methodologies commonly used to determine these parameters and closely approximate the 95% confidence interval. The PALs™ are based on analytical verification data generated by ERA, independent referee laboratory results and data from USEPA methods, WP, WS and CLP interlaboratory studies. If your result falls outside of the PAL™, ERA recommends that you investigate potential sources of error in your preparation and/or analytical procedures. For further technical assistance, call ERA at 1-800-372-0122.

Prepared By: MES

Reviewed By: TAM

Date: 5/28/98

Date: 5/28/98



**ENVIRONMENTAL
RESOURCE ASSOCIATES**
ARVADA, COLORADO 1-800-372-0122

Certification

LLNL

Quality Control Standards

Catalog N° 093

Lot N° 0522-98-05

Custom Standard

Semivolatiles in Water

<u>Parameter</u>	<u>Certified Value</u> (ug/L)	<u>Performance Acceptance Limits™</u> (ug/L)
1-Methylnaphthalene	2.80	NA
2-Methylnaphthalene	2.82	0.905-3.33
Naphthalene	2.94	1.04-3.35

Standard Preparation Instructions: None required. The standard is ready for preparation and analysis as received.

Preservative: None.

Storage: Store at 4°C.

NA - Performance Acceptance Limits™ not currently available.

Performance Acceptance Limits (PALs™) are listed as guidelines for acceptable analytical results given the limitations of the USEPA methodologies commonly used to determine these parameters and closely approximate the 95% confidence interval. The PALs™ are based on analytical verification data generated by ERA, independent referee laboratory results and data from USEPA methods, WP, WS and CLP interlaboratory studies. If your result falls outside of the PAL™, ERA recommends that you investigate potential sources of error in your preparation and/or analytical procedures. For further technical assistance, call ERA at 1-800-372-0122.

Prepared By: MES

Reviewed By: T+M

Date: 5/28/98

Date: 5/28/98



Certification

LLNL

Quality Control Standards

Catalog N° 093

Lot N° 0522-98-05

Custom Standard

Volatiles in Soil

<u>Parameter</u>	<u>Certified Value</u> (ug/Kg)	<u>Performance Acceptance Limits™</u> (ug/Kg)
Naphthalene	7.45	NA
Trichloroethylene	8.09	2.19-10.9
Xylenes, total	30.1	18.6-43.6

Standard Preparation Instructions: None required. The standard is ready for preparation and analysis as received.

Preservative: None.

Storage: Store at 4°C.

The **Certified Values** are reported on a wet weight basis.

NA - Performance Acceptance Limits™ not currently available.

Performance Acceptance Limit (PAL™) are listed as a guideline for acceptable analytical results given the limitations of the USEPA methodologies commonly used to determine this parameter and closely approximate the 95% confidence interval. The PAL™ is based on analytical verification data generated by ERA and data from ERA's InterLab™ Soil Studies. If your result falls outside of the PAL™, ERA recommends that you investigate potential sources of error in your preparation and/or analytical procedures. For further technical assistance, call ERA at 1-800-372-0122.

Prepared By: MES

Reviewed By: TAV

Date: 6/4/98

Date: 6/4/98



**ENVIRONMENTAL
RESOURCE ASSOCIATES**
ARVADA, COLORADO 1-800-372-0122

Certification

LLNL

Quality Control Standards

Catalog N° 093

Lot N° 0522-98-05

Custom Standard

Semivolatiles in Soil

<u>Parameter</u>	<u>Certified Value</u> (ug/Kg)	<u>Performance Acceptance Limits™</u> (ug/Kg)
1-Methylnaphthalene	117	NA
2-Methylnaphthalene	126	NA
Naphthalene	131	19.4-138

Standard Preparation Instructions: None required. The standard is ready for preparation and analysis as received.

Preservative: None.

Storage: Store at 4°C.

NA - Performance Acceptance Limits™ not currently available.

Performance Acceptance Limit (PAL™) are listed as a guideline for acceptable analytical results given the limitations of the USEPA methodologies commonly used to determine this parameter and closely approximate the 95% confidence interval. The PAL™ is based on analytical verification data generated by ERA and data from ERA's InterLaB™ Soil Studies. If your result falls outside of the PAL™, ERA recommends that you investigate potential sources of error in your preparation and/or analytical procedures. For further technical assistance, call ERA at 1-800-372-0122.

Prepared By: MES

Reviewed By: TAM

Date: 5/28/98

Date: 5/28/98



**ENVIRONMENTAL
RESOURCE ASSOCIATES**

June 9, 1998

Tina Carlson
Lawrence Livermore National Lab
7000 East Ave., L-544
Livermore, CA 94550

FAX: 925-423-5764

Dear Tina:

Enclosed you will find the certification sheets for the single blind Performance Evaluation standards sent to Bill Draper at California Department of Health Services and Jason Geddes at Nevada Environmental Laboratory on 6/9/98. Please refer to ERA project # 0604-98-01 for any future inquiries.

If you have any questions, please feel free to call me at the toll-free number 1-800-372-0122.

Sincerely,

A handwritten signature in black ink, appearing to read "M. E. Blades".

Michael E. Blades
Chemist

Enclosures



Certification

LLNL

Quality Control Standards

Catalog Nº 093

Lot Nº 0604-98-01

Volatiles in Water

<u>Parameter</u>	<u>Certified Value</u> (ug/L)	<u>Performance Acceptance Limits™</u> (ug/L)
Naphthalene	1.51	NA
Trichloroethylene	1.50	1.12-1.82
m-Xylene	1.51	0.979-1.90
o-Xylene	1.51	0.976-1.90
p-Xylene	1.44	0.932-1.81

Standard Preparation Instructions: None required. The standard is ready for preparation and analysis as received.

Preservative: HCL.

Storage: Store at 4°C.

NA - Performance Acceptance Limits™ not currently available.

Performance Acceptance Limits (PALs™) are listed as guidelines for acceptable analytical results given the limitations of the USEPA methodologies commonly used to determine these parameters and closely approximate the 95% confidence interval. The PALs™ are based on analytical verification data generated by ERA, independent referee laboratory results and data from USEPA methods, WP, WS and CLP interlaboratory studies. If your result falls outside of the PAL™, ERA recommends that you investigate potential sources of error in your preparation and/or analytical procedures. For further technical assistance, call ERA at 1-800-372-0122.

Prepared By: MERS

Reviewed By: TAM

Date: 6/8/98

Date: 6/8/98

Custom Standard



Certification

LLNL

Quality Control Standards

Catalog Nº 093

Lot Nº 0604-98-01

Semivolatiles in Water

<u>Parameter</u>	<u>Certified Value</u> (ug/L)	<u>Performance Acceptance Limits™</u> (ug/L)
1-Methylnaphthalene	4.20	NA
2-Methylnaphthalene	4.03	1.29-4.73

Standard Preparation Instructions: None required. The standard is ready for preparation and analysis as received.

Preservative: None.

Storage: Store at 4°C.

NA - Performance Acceptance Limits™ not currently available.

Performance Acceptance Limits (PALs™) are listed as guidelines for acceptable analytical results given the limitations of the USEPA methodologies commonly used to determine these parameters and closely approximate the 95% confidence interval. The PALs™ are based on analytical verification data generated by ERA, independent referee laboratory results and data from USEPA methods, WP, WS and CLP interlaboratory studies. If your result falls outside of the PAL™, ERA recommends that you investigate potential sources of error in your preparation and/or analytical procedures. For further technical assistance, call ERA at 1-800-372-0122.

Prepared By: MEB

Reviewed By: TAM

Date: 6/11/98

Date: 6/11/98

Custom Standard



Certification

LLNL

Quality Control Standards

Catalog № 093

Lot № 0604-98-01

Semivolatiles in Soil

<u>Parameter</u>	<u>Certified Value</u> (ug/Kg)	<u>Performance Acceptance Limits™</u> (ug/Kg)
1-Methylnaphthalene	117	NA
2-Methylnaphthalene	114	NA

Standard Preparation Instructions: None required. The standard is ready for preparation and analysis as received.

Preservative: None.

Storage: Store at 4°C.

NA - Performance Acceptance Limits™ not currently available.

Performance Acceptance Limit (PAL™) are listed as a guideline for acceptable analytical results given the limitations of the USEPA methodologies commonly used to determine this parameter and closely approximate the 95% confidence interval. The PAL™ is based on analytical verification data generated by ERA and data from ERA's InterLaB™ Soil Studies. If your result falls outside of the PAL™, ERA recommends that you investigate potential sources of error in your preparation and/or analytical procedures. For further technical assistance, call ERA at 1-800-372-0122.

Prepared By: MER

Reviewed By: TAM

Date: 6/11/98

Date: 6/11/98

Custom Standard



Certification

LLNL

Quality Control Standards

Catalog Nº 093

Lot Nº 0604-98-01

Volatiles in Soil

<u>Parameter</u>	<u>Certified Value</u>	<u>Performance Acceptance Limits™</u>
	<u>(ug/Kg)</u>	<u>(ug/Kg)</u>
Naphthalene	7.97	NA
Trichloroethylene	7.73	5.67-9.51
m-Xylene	8.07	6.50-10.3
o-Xylene	7.76	6.25-9.93
p-Xylene	8.24	6.63-10.5

Standard Preparation Instructions: Weigh 5.0 grams of Volatiles Blank Soil Matrix into your extraction vessel. Equilibrate the spiking concentrate to ambient temperature. Using a 10ul syringe, inject 10 microliters of the concentrate into the Volatiles Blank Soil Matrix by placing the syringe tip slightly below the surface of Volatiles Blank Soil Matrix in the extraction vessel. Immediately complete other sample preparation steps according to your analytical procedures.

Preservative: None.

Storage: Store at 4°C.

NA - Performance Acceptance Limits™ not currently available.

Performance Acceptance Limit (PAL™) are listed as a guideline for acceptable analytical results given the limitations of the USEPA methodologies commonly used to determine this parameter and closely approximate the 95% confidence interval. The PAL™ is based on analytical verification data generated by ERA and data from ERA's InterLaB™ Soil Studies. If your result falls outside of the PAL™, ERA recommends that you investigate potential sources of error in your preparation and/or analytical procedures. For further technical assistance, call ERA at 1-800-372-0122.

Prepared By: MES

Reviewed By: TAM

Date: 6/8/98

Date: 6/8/98

Custom Standard

Attachment 8

**Draft LLNL Statement of Work for
Hydrogeological Services
Provided to Plumas County**

Plumas County Request for Proposals

**List of Potential Hydrogeological
Service Consultants Provided
to Plumas County by LLNL**

DRAFT
Statement of Work
for the Reevaluation of the
Lake Davis Area Hydrogeology

Introduction

Lake Davis is a reservoir located in the Plumas National Forest, Plumas Co., California. Lake Davis was created as a result of the damming of Big Grizzly Creek in 1958. The California Department of Water Resources (DWR) operates the reservoir for recreation and to supply domestic water to the city of Portola and the Grizzly Lake Resort Improvement District. According to the California Department of Fish and Game (DFG), the highly predaceous, non-native northern pike was found in Lake Davis in 1994. The DFG believed the presence of the pike presented a significant threat to California fisheries, particularly to the Sacramento-San Joaquin Delta. As a consequence, the DFG elected to eradicate all fish from Lake Davis, with subsequent restocking of game trout. The fish eradication was done by treating Lake Davis with formulated Rotenone products on October 15, 1997. Rotenone is a pesticide registered by the U. S. Environmental Protection Agency for eradication of fish. Rotenone is a naturally occurring, complex rotenoid, obtained from roots of tropical plants. At Lake Davis, two products were used, liquid formulated Nusyn-Noxfish Fish Toxicant, and the powdered Pro-Noxfish Dust Fish Toxicant. Both products contain chemical substances beside Rotenone for dispersing the product, as well as enhancing rotenone fish kill efficacy.

Several state agencies are involved in the Lake Davis eradication project. These include the DWR and DFG (both Departments within the Resources Agency of California), as well as the Department of Health Services (DHS) and the Central Valley Regional Water Quality Control Board (CVRWQCB). The DHS is monitoring the water from Lake Davis to determine when it can be again used as a domestic water supply. The CVRWQCB issued Waste Discharge Requirements to the DFG for discharges of chemical substances into Lake Davis and Big Grizzly Creek.

Local agencies and residents of Plumas County are concerned that the chemical substances used in the treatment of Lake Davis, its tributaries and discharge, could adversely effect local ground water supplies. Lawrence Livermore National Laboratory (LLNL) was contacted by Mr. James Stretch, Plumas County Administrative Officer to provide assistance in preparing a statement of work to evaluate any potential threat to ground water supplies. Although the hydrogeology of the Lake Davis area was evaluated by the DWR in DWR Project Geology Report No 15-10-13 (August 1997), local residents remain unconvinced concerning the conclusions drawn by the DWR in this report. Concern appears to be centered on whether ground water aquifers in the vicinity of Lake Davis are in communication with the lake. At the request of Plumas County officials, LLNL has prepared this statement of work for the reevaluation of the conclusions reached by the DWR concerning the potential threat the treatment of Lake Davis posed to the area ground water.

Purpose

The field evidence for the conclusions presented in DWR Project Geology Report No 15-10-13 (August 1997) was not provided in sufficient detail to allow peer review of the analysis. As such, re-analysis of the existing technical reports, documents, and memoranda used by the DWR by an independent consulting hydrogeologist (registered in the State of California with extensive experience in evaluating the hydrogeology of bedrock aquifer systems) is being requested. Specifically, the hydraulic communication between local water-supply wells and Lake Davis must be determined and supporting field evidence must be identified and cited.

Based on the information presented in the DWR report, it is presumed that most (if not all) local water-supply wells are completed in the bedrock aquifer. The primary bedrock water-supply well discussed in the report is the Portola Area Corporation Yard Well, which is completed to a depth of 453 feet, with a slotted interval from 100 to 443 feet. This well's production is attributed to "a quartz monzonite zone which ranges from 340 feet to the hole bottom." This zone is characterized as "fractured granitic rock." "The drawdown on the monitoring wells was between only 1.74 and 2.29 feet. This consistency suggests some continuity between the upper water zones and the lower producing zone..... This interpretation suggests that groundwater from the upper zones can enter the well through upper bedrock fractures." (p. 16 City of Portola and Lake Davis Alternate Water Supply Investigation Report - Project Geology Report 15-10-13, August 1997).

Some attention has been given to the concerns of local residents (e.g., Lake Davis resident James Bishop) regarding the hydraulic connection of Lake Davis and water-supply wells in the vicinity. However, the specific field evidence for the "many geologic factors which make it extremely unlikely that treated lake water will reach the water wells in the vicinity of the lake" listed in the August 1997 DWR Project Geology Report is not cited or presented, and thus the conclusions can not be substantiated. The following questions relate to these conclusions:

- The ancient lake deposit sediments act somewhat as a liner - to what extent? Do these sediments fully line the entire lake?
- While it is true that faults typically act as groundwater barriers, it is clear that fracture flow is the dominant transport mechanism in the bedrock aquifer. Due to complexity of fracture flow, lack of deep local wells, poor well log data, it is difficult to generalize ground water fracture flow characteristics.
- Groundwater springs and seeps naturally occurring at elevations above the lake - what aquifers are these springs emanating from? If they are alluvial springs outcropping from the alluvial/bedrock contact, then it can not be concluded that the bedrock is not in communication with Lake Davis.

- As indicated by the finding that “The main source of water in the Corporation Yard Well is from fractured granitic rock, as demonstrated by the pumping and recovery tests, and the electric log of the well.” (Letter from Fran L. Glick and Glen Pearson to Brian J. Finlayson, Department of Fish and Game, regarding the City of Portola, Alternate Water Supply Investigation; Preliminary Report Number 3, dated July 3, 1997), the primary groundwater transport mechanism in the bedrock aquifer(s) is fracture permeability. Fracture flow typically is very complex and dependent upon primary and secondary fracture orientations, gouge type, etc. Faults mapped on figure 2 show a general NW-SE trend. However, secondary faults display a NE-SW trend. Again, there is insufficient field data cited or presented to draw the conclusion that “faults would carry any water to the southeast, away from the City of Portola.”
- “We are not aware of any lake water seeping through the ground and surfacing elsewhere.” This is not conclusive that local water-supply wells are not in hydraulic communication with Lake Davis. Is the water quality of the Lake Davis and the bedrock aquifer significantly different? If so, this may be cited as supporting evidence for the lack of hydraulic communication.
- Lake Seepage - a simple water budget calculation was referenced on page 21 of the DWR Project Geology Report No 15-10-13 (August 1997) without benefit of the actual data used in the calculation. What are the sources of the data used? What are the data error bars? How sensitive is the water budget to the sources of measurement error? Water budget calculations serve as rough estimates for watershed inflow and outflow and are rarely accurate enough to predict local phenomena.

The hydraulic communication of fractures in the bedrock aquifer is contingent upon interconnectivity of subsurface fractures, fracture gouge type, etc. which has not been determined. It is also understood that fracture flow is complex and that there is a high level of uncertainty with the interpretation of fracture flow due to the anisotropy of fracture orientation and frequency.

Scope of Work : Review of existing technical reports, documents, and memoranda

The contract Hydrogeologist(s) shall:

1. Review all hydrogeologic data and conclusions presented in previous documents, reports, and memoranda in order to evaluate the conclusions reached in DWR Project Geology Report No 15-10-13 (August 1997). Attachment A lists identified documents and available primary data that should be included in the review. Other applicable documents or data identified during the work should also be included in the review.

2. Identify gaps in hydrogeologic data and assess the ability to draw definitive conclusions regarding the hydraulic communication between local water-supply wells and Lake Davis. Prepare Piper Tri-linear and/or Stiff diagrams of existing ground water and lake water geochemical data to identify unique and distinguishing characteristics, if any.
3. Should the reevaluation of the hydrogeologic data indicate a high likelihood that water from Lake Davis is in communication with the underlying aquifer(s), the contract hydrogeologist(s) shall make a preliminary evaluation of the environmental fate and transport of the chemicals used to threat Lake Davis (i.e., rotenone, piperonyl butoxide and selected volatile organic compounds) with respect to their potential for reaching the underlying ground water.
4. Present recommendations for future field tests and/or surveys, which may include
 - The collection, analysis and interpretation of geologic, geophysical, geochemical, chemical, petrophysical, and hydrogeologic data (such as soil, rock, and ground/lake water sampling and analysis)
 - The graphing, interpretation, and presentation of additional ground water and Lake Davis water general minerals analytical data in the form of Piper Tri-linear diagrams, Stiff Diagrams, etc. to classify ground water geochemistry
 - Age dating of local bedrock ground water
 - Hydraulic testing and analysis (e.g., including pumping tests, tracer tests, and slug tests); geochemical analyses; isotope studies
 - Surface and subsurface geophysical measurements
 - Geologic logging of exploratory borings and/or existing monitor wells
 - The installation of ground water monitor wells, piezometers, extraction wells, lysimeters and/or other monitoring devices, and the identification of drilling locations
 - The testing and development of ground water monitor wells
 - Construction of a simple subsurface hydraulic model that includes possible cases to be considered.

Qualifications:

The consulting Hydrogeologist(s) shall:

- be registered in the State of California
- have earned a M.S. or PhD in Hydrogeology or Engineering Geology
- have a minimum of 10 years experience in evaluating the hydrogeology of bedrock aquifer systems with demonstrated expertise in:
 - in hydrogeology, hydrology, geology, geophysics, rock properties, petrophysics, geochemistry, soil and water sampling, well drilling and installation, geologic well logging, data gathering, and data interpretation.

- assessing the hydrogeologic characteristics of affected water zones and interpreting the fate and transport of the environmental contaminants.
 - both analytic and numeric ground water modeling code or other codes to predict fate and transport of contaminants.
- Demonstrate impartial, independent, and objective judgment

Deliverables:

1. Weekly progress reports will be made to the contract administrator and/or other parties as determined by the contract administrator. These progress reports will be either verbal or written, as necessary.
2. Presentation of preliminary findings during a review meeting prior to submittal of final report. Questions raised during this meeting should be addressed during the meeting, if possible, and in the final report. Findings should be presented in sufficient detail to allow decision makers to determine if additional work will be warranted, and to begin preparation of any additional requests for proposals for future work.
3. Submission of final report detailing results of document review, additional data needs, conclusions, and scope of additional work (if appropriate). This report should contain sufficient detail to allow independent evaluation of all conclusions reached.

Due Dates:

1. Presentation of Preliminary Findings: two months after placement of contract.
2. Submission of Final Report: two months after presentation of preliminary findings.

Attachment A

Identified Documents and Data

Documents

- Berry, David., 1974, *Geology of the Portola and Reconnaissance Peak Quadrangles, Plumas County, California*: M.S. in Geology thesis at University of California, Davis (UCD). (A reference material at UCD).
- Durrel, Cordell, 1987, *Geologic History of the Feather River Country, California*: University of California Press, Berkeley and Los Angeles, CA. (A reference material at the University of California, Berkeley).
- Department of Fish and Game, 1997, *Lake Davis Northern Pike Eradication Project - January 1997 - Final Environmental Impact Report*. (The Department of Fish and Game and LLNL have copies of this document).
- Department of Water Resources, 1958, *Engineering Geology of Grizzly Valley Dam Site on Big Grizzly Creek, Plumas County*: Project Geology Report 15-10-01, 23p., 5 plates. (The DWR may have a copy of this report).
- Department of Water Resources, 1963, *Northeastern Counties Ground Water Investigation*: DWR Bulletin 98, Volume 1, February 1963, pp. 50-155. (A reference material at the University of California, Berkeley).
- Department of Water Resources, 1964, *Geology and Construction Materials Data: Grizzly Valley Dam and Reservoir, State Water Facilities, Upper Feather Division, Plumas County, California*: Project Geology Report D-28, February 1964, 7 p., 7 plates. (The DWR may have a copy of this report).
- Department of Water Resources, 1971, *Lake Davis Basin Water Quality Investigation, Plumas County/ a Cooperative Investigation by DWR and Plumas County*, 1971. (University of California, Berkeley and LLNL have copies of this document).
- Department of Water Resources, 1997, *City of Portola and Lake Davis Alternate Water Supply Investigation Report*: Project Geology Section, Report No. 15-10-13, August 1997. (The DWR and LLNL have copies of this document).
- Specimen Label and MSDS for Nusyn-Noxfish and Pro-Noxfish (DHS, Plumas County and LLNL have copies of these labels).

Data

Well logs and maps of assessor parcels with locations of wells south of Lake Davis. (Plumas County and LLNL have copies of the well logs and maps for the wells in the Lake Davis area).

Water Quality Data collected on the Lake by DWR. Watermaster Ralph Howell from the Oroville Field Division at the Beckwourth Subcenter of DWR collects samples for dissolved oxygen, pH, turbidity, secchi disc reading, phytoplankton, and MTBE from the lake. However, he does not maintain much of the results. Summary reports of this data will need to be obtained from Berry Montoya (916-653-4383) Operations and Maintenance, Water Quality Division of DWR in Sacramento. His boss is Jeff Janik. Will need to request water quality reports for the Upper Feather River Lakes, Lake Davis. Copies of seasonal water temperatures have been provided to LLNL.

Analytical data available for samples from selected area wells and water column and sediment samples from Lake Davis collected by DHS. Assessor Parcel Number with wells which are currently being monitored by DHS:

25-330-04
25-251-04
25-240-51
25-240-72

Plumas County Department of Health has additional analytical data for area wells.

DEPARTMENT OF PUBLIC WORKS

1834 EAST MAIN, QUINCY, CA 95971 TELEPHONE (916) 283-6268 FAX 283-6323

TOM HUNTER
DIRECTORRICHARD HUMPHREY
DEPUTY DIRECTOR OF PUBLIC WORKSMARTIN BYRNE
ASST. DIRECTOR OF PUBLIC WORKS**MEMORANDUM**

DATE: April 24, 1998

TO: Prospective Contractors

FROM: Tom Hunter, Director of Public Works *Tom Hunter*

RE: Proposals for the Reevaluation of the Lake Davis Hydrogeology

Enclosed is a Statement of Work that has been prepared by the Lawrence Livermore National Laboratory to perform certain tasks in the area of Lake Davis, Plumas County, California. I am seeking proposals from your firm to satisfy the requirements of the Statement of Work. Your proposals should be submitted to:

Director of Public Works
1834 East Main Street
Quincy, CA 95971

The proposals shall include the cost to satisfy the Statement of Work; the time schedules to perform this work; what your staff consists of; and who would be in charge of the work. References for these individuals would certainly be expected. The proposal shall be received by the Department of Public Works no later than 5:00 p.m., May 15, 1998.

If you have any questions, you can contact this office, or Tina Carlsen of Lawrence Livermore National Laboratory at (510)442-1100.

Enclosure

A6:proposal

COPY

HYDROGEOLOGIC SERVICES
BIDDERS LIST

Alisto Engineering
1575 Treat Blvd
Walnut Creek, CA 94598
P (510)295-1650
F (510)295-1823
Bernie Wroblewski

American Operations Corporation
1420 Springhill Road Suite 300
McLean, VA 22012
P(703)734-7766
F(703)734-1976
Mike Cushman

Beyez & Patel, Inc.
800 South Broadway
Suite 200
Attention: Dan E. Verwoert
Walnut Creek, CA 94596-5218
P (510) 934-0707
F (510) 934-0318

Brunsing Associates, Inc.
930 Shiloh Road
Building 44B
Attention: Dr. William Muellenhoff
Windsor, CA 95492
P (707) 838-3027
F (707) 838-4420

Chow Engineering, Company
P. O. Box 2271
10th Floor
Attention: Reuben H. Chow
San Leandro, CA 94577
P (510) 537-5100
F (510) 537-5228

Erler & Kalinowski
1730 So. Amphett Blvd. #320
San Mateo, CA 94402
P (415)578-1172
F (415)578-9131
Earl James

Post-It™ brand fax transmittal memo 7671		# of pages ▶ 3
To	Tam Hunter	From Tina Carlsen
Co.		Co. LPL
Dept.		Phone #
Fax #	530-283-6323	Fax #

Geometrix Consultants
100 Pine Street
10th Floor
Attention: Karen E. Ball
San Francisco, CA 94111
P (415) 434-9400
F (415) 434-1365

Hydrologic Consultants, Inc.
1947 Galileo Ct. #101
Davis, CA 95616
P(916)756-0925
F(916)756-9230
Tim Durbin

Levine-Fricke
1900 Powell St., 12th Floor
Emeryville, CA 94608
P(510)652-4500
F(510)652-2246
Chip Koch

Leyland Gardner & Assoc.
1020 Corporation Way #103
Palo Alto, CA 94303
P (415) 962-6706
F (415) 962-6707

The Mark Group Engineers & Geologists
3480 Buskirk, Suite 120
Pleasant Hill, CA 94523
P (510)946-1055
F (510)946-9813
Tom Donovan

On-Site Technologies, Inc.
1715 S. Bascom Ave. #200
Campbell, CA 95008
P (408)371-4810
F (408)371-2010
Arvind Acharya

SCS Engineers
6761 Sierra Court
Suite D
Attention: Karl Barber
Dublin, CA 94568-2611
P (510) 829-0661
F (510) 829-5493

Uribe & Assoc.
2930 Lakeshore Ave. #200
Oakland, CA 94610
(510) 832-2233
(510) 832-2237
Fred Krieger

Versar, Inc.
1255 Harbor Bay Parkway #100
Alameda, CA 94502
P (510) 814-5900
F (510) 814-5901

Weiss Associates
5500 Shellmound St., Suite 100
Emeryville, CA 94608
P(510) 450-6000
F(510) 547-5043
Beth Springston

X-Sender: e232252@popup.llnl.gov
Mime-Version: 1.0
Date: Fri, 10 Apr 1998 08:11:51 -0800
To: carlsen1@llnl.gov
From: Tom Dresser <dresser3@llnl.gov>
Subject: Suppliers - Hydrogeological

Tina,

Here are a few companies per your request.

Espana Consulting Associates

502 Guiseppe Ct., Ste. 11
Roseville, CA 95678
Attn: Carlos Espana
(916) 773-2600

Geotechnical **engineering** consulting, geology, hydrogeology, earthquake engineering, hazardous materials assessments, pavement design.

Applied Environmental Technologies, Inc.

4840 Market St., Ste. B
Ventura, CA 93303-5700
Attn: Ian C. MacFarlane
(805) 650-1400

Hazardous waste site **remediation**, regulatory compliance, air quality modeling, hydrogeology, **engineering consulting**, asbestos consulting, underground storage tank removal, soil and groundwater remediation, wastewater/storwater management, risk assessment, groundwater and air monitoring.

Uribe & Associates

2930 Lakeshore Avenue, Suite 200
Oakland, CA 94612
Attn: Adam J. Wise
(510) 832-2233

Environmental consulting services: including hazardous waste management, air quality, water quality, health and safety planning and regulatory compliance. Risk assessments, hydrogeologic characterization, soil and groundwater, sampling. Monitoring well installation, investigation and remediation, best management practices program development, storm water management. Policy & planning and regulatory compliance.

Jonas & Associates, Inc.

2815 Mithchell Dr., Suite 209
Walnut Creek, CA 94598
Attn: Romena Jonas
(925) 933-5360

Environmental Consulting

Geologist / hydrogeologist
Contamination investigation & cleanup

Ogiso Environmental

PO Box 61025
Sunnyvale, CA 94086
Attn: Dr. Clement I. Okoh

Environmental consulting, hazardous waste handling, remediation, disposal.

Engineering, groundwater monitoring, management and protection; landfill operation. Closure, and postclosure; hydrology, hydrogeology, and groundwater modeling; environmental impact studies; regulatory compliance.

Applied Geosciences, Inc.

17321 Irvine Blvd.
Tustin, CA 92680
Attn: Jon Lovegreen
(714) 734-0303

Consulting services, engineering geology, environmental impact reports & studies, EIR & EIS, underground tank monitoring, site characterizations, hydrogeology RCRA permits, remedial action plans, hazardous waste spill cleanup, foundation design, environmental audits, groundwater studies, decision analysis, expert witness, phase I environmental assessments, Phase II soil and groundwater investigations, Phase III soil and groundwater remediation.

Bryan A. Stirrat & Associates

3780 Rosin Ct., Suite 260
Sacramento, CA 95834
Attn: Gary Hill
(916) 568-8300

Consulting, civil and environmental engineering, Site planning & development, landscape architecture, geotechnical services.

Solid Waste Management: landfill design, integrated waste management & diversion plans, Leachate collectin & treatment, hydrogeologic services, post closure monitoring & maintenance.

Environmental Services: regulatory compliance, environmental assessments, site investigations, feasibility studies, remedial design & implementation, industrial waste treatment systems, underground storage tank services, air and water swats, air quality, industrial hygiene.

Advanced Assessment & Remediation Services

3800 Vista Oaks Dr., Ste, 201
Martinez, CA 94553

Attn: Tridib K. Guha, R.G., R.E.A.

Phase I & Phase II environmental assessment & compliance audit; site assessment & characterization, remedial investigation & feasibility study, underground storage tank program, remedial engineering including in-site & ex-site bio-remediation, hazardous materials & waste management, lead based paint surveying & inspection, geotechnical **engineering geology.**

Primarily services are provided in the following areas: **Hydrogeologic site assessment, remedial investigations and feasibility studies, remedial engineering regulatory compliance, permitting & emission evaluation.**

A&M ENGINEERING & ENVIRONMENTAL SERVICES I

10010 East 16th Street
TULSA, OK 74128-4813
Phone Number: 918-665-6575
Fax Number: 918-665-6576
E-mail Address: aandm@galstar.com
Contact Person: BARRY HOLCOMBE
Contact Title: MKTG DIR
Year Established: 1986
Average Annual Gross Revenue: \$2,700,000
Capabilities Narrative:

ENVIRONMENTAL CONSULTING, DESIGN, CONSTRUCTION; AIR QUALITY SERVICES; HAZARDOUS WASTE MANAGEMENT; GROUNDWATER REMEDIATION; GEOLOGICAL & HYDROGEOLOGICAL SERVICES; SARA

REPORTING; NPDES PERMIT APPLICATIONS; ENVIRONMENTAL SITE ASSESSMENTS; SITE REMEDIATION;

Special Equipment/materials:

Construction Bonding Level
(per contract) \$6,000,000
Construction Bonding Level
(aggregate) \$6,000,000
Service Bonding Level (per
contract) \$6,000,000
Service Bonding Level
(aggregate) \$6,000,000

HYDROSOURCE ASSOCIATES INC

PO BOX 609
26 WINTER STREET
ASHLAND, NH 03217-0609
Phone Number: 603-968-3733
Fax Number: 603-968-7605
E-mail Address: teamh2o@cyberportal.net
Contact Person: CLAUDE A. CORMIER
Contact Title: VICE PRESIDENT
Year Established: 1991
Average Annual Gross Revenue: \$500,000

Capabilities Narrative:

WATER RESOURCES DEVELOPMENT (GROUNDWATER), AQUIFER EXPLORATION, MAPPING, SURVEYING
(GEOPHYSICAL), WELL DRILLING, GROUNDWATER EXPLORATION, DEVELOPMENT, PROTECTION (&
SITING).

Special Equipment/materials:

GIS, IMAGE PROCESSING, GEOPHYSICAL: VLF EM, GRAVITY, MAGNETOMETER, RESISTIVITY, SEISMICS

HOFFER & ASSOCIATES

RR 4 BOX 2286
MONTPELIER, VT 05602-8927
Phone Number: 802-229-1113
Fax Number: 802-229-2780
E-mail Address: geohoff@AOL.com
WWW Page: <http://www.comnriver.net/hoffer>
Contact Person: JEFF HOFFER
Contact Title: PRINCIPAL HYDROGEOLOGIST
Year Established: 1992

Average Annual Gross Revenue: \$100,000

Capabilities Narrative:

HYDROGEOLOGIC CONSULTING - ENVIRONMENTAL AND GROUNDWATER INVESTIGATIONS. DOWNHOLE
TELEVISION SURVEYING OF WATER WELLS AND BORE HOLES. GEOPHYSICAL EQUIPMENT.
UNDERGROUND STORAGE TANK (UST) INVESTIGATIONS. GROUNDWATER EXPLORATION AND WELL
SITING. GEOLOGIC A

Special Equipment/materials:

BOREHOLE VIDEO CAMERAS/DOWNHOLE TV SURVEY EQPT

JL ROGERS & CALLCOTT ENGINEERS INC

PO BOX 5655
GREENVILLE, SC 29606-5655
Phone Number: 864-232-1556
Fax Number: 864-233-9058
E-mail Address: rcengrs@aol.com
Contact Person: J L ROGERS
Contact Title: PRESIDENT
Year Established: 1969
Average Annual Gross Revenue: \$4,200,000
Accepts Visa Card?: Yes No

Capabilities Narrative:

WE ARE EXPERIENCED ENVIRONMENTAL ENGINEERS THAT ALSO OPERATE A FULL SCALE ENVIRONMENTAL LABORATORY. OUR LAB ANALYSES IN THE FOLLOWING AREAS: WATER, WASTEWATER, SOLID AND HAZARDOUS WASTE, AIR, ETC. ADDITIONAL SERVICES INCLUDE HYDROGEOLOGY AND STACK TESTS

Special Equipment/materials:

FULL SERVICE LAB, AA, ICP,GC,GC/MS,TOC,TOX, Method 5 Stack Testing

LAND AND WATER ENVIRONMENTAL SERVICES INC

525 SE MAIN ST

ROSEBURG, OR 97470-4933

Phone Number: 541-672-0393

Fax Number: 541-672-7170

E-mail Address: lawesi@wizzards.net

Contact Person: TIM MARSHALL

Contact Title: VICE PRES

DUNS Number: 824747448

Year Established: 1992

Average Annual Gross Revenue: \$400,000

Accepts Visa Card?: Yes No

Capabilities Narrative:

GEOLOGY, HYDROGEOLOGY AND BIOLOGY CONSULTING, ENVIRONMENTAL IMPACT STUDIES, STREAM/FISHERY REHABILITATION, ENVIRONMENTAL ASSESSMENTS, WATER QUALITY STUDIES AND REMEDIAL DESIGN, HABITAT IMPROVEMENT, WATER MONITORING, FISH AND STREAM, GEOTECHNICAL

Special Equipment/materials:

WATER QUALITY SAMPLING/MEASUREMENT,FISH SAMPLING,STREAM FLOW

BRISTOL ENVIRONMENTAL SERVICES CORP

PO BOX 366

BELLEVUE, WA 98009-0366

Phone Number: 425-889-1640

Fax Number: 425-739-0745

E-mail Address: mccrumb@ibm.net

WWW Page: http://alaska.net/bes/home_page.htm

Contact Person: DENNIS MCCRUMB

Contact Title: PROGRAM MANAGER

DUNS Number: 929222040

Year Established: 1994

Average Annual Gross Revenue: \$5,000,000

Accepts Visa Card?: Capabilities Narrative:

HAZARDOUS WASTE MANAGEMENT; ENVIRONMENTAL & ITS PHASE I & II SITE ASSESSMENTS; UNDERGROUND STORAGE TANKS; ASBESTOS INSPECTIONS; REGULATORY PERMITTING; EXPERT TESTIMONY; POLLUTION PREVENTION; REMEDIATION. Yes No

JOHN LAMANNA GEOLOGICAL CONSULTING SERVICE

2611 40TH AVE W

SEATTLE, WA 98199-3136

Phone Number: 206-284-4565

Fax Number: 206-284-4565

Contact Person: JOHN LAMANNA

Contact Title: OWNER/PROP

Year Established: 1997

Average Annual Gross Revenue: Capabilities Narrative:

GEOLOGICAL CONSULTING, Temporary technical project support, ENVIRONMENTAL MONITORING, SURFACE Water Quality, EROSION problems, STREAM CHANNEL PROBLEM issues, SLOPE STABILITY problems, WATERSHED ANALYSIS, CULVERT FISH-PASSAGE.

Special Equipment/materials:

Field vehicle, portable computer, stereoscope, field equipment \$0

FERRERO GEOLOGIC

760 OAK ST

ASHLAND, OR 97520-1261
Phone Number: 541-488-2452
Fax Number: 541-488-6473
E-mail Address: tferrero@mind.net
Contact Person: TOM FERRERO
Contact Title: ENGINEERING GEOLOGIST
DUNS Number: 175328707
Year Established: 1983
Average Annual Gross Revenue: \$48,000 Capabilities Narrative:
ENGINEERING, GROUNDWATER, ENVIRONMENTAL & MINING GEOLOGIC STUDIES, SITE
SLOPE/FOUNDATION STABILITY STUDIES, AERIAL PHOTO/FIELD MAPPING OF GEOLOGY, SOIL & STABILITY FEATURES,
SPRING/WELL WATERSHED AREA MAPPING, WATER SHED REHABILITATION STUDIES

P SQUARED TECHNOLOGIES INC
PO BOX 22668
10938 Hardin Valley Road
KNOXVILLE, TN 37933-0668
Phone Number: 423-691-3668
Fax Number: 423-691-0611
E-mail Address: rcraig@p2t.com
WWW Page: <http://www.p2t.com>
Contact Person: PAUL M CRAIG
Contact Title: PRESIDENT
DUNS Number: 175849298
Year Established: 1985
Average Annual Gross Revenue: \$2,670,000
Accepts Visa Card?: Yes No Capabilities Narrative:
ENVIRONMENTAL ENGINEERING: INVESTIGATION, MONITORING, MODELING, ASSESSEMENT OF SURFACE
WATER, GROUNDWATER, HYDRAULICS, HYDROLOGY, GEOPHYSICS, CONTAMINANT FATE AND
TRANSPORT, PHYSICAL HYDRAULIC MODELING, AIR QUALITY MODELING, FIELD SERVICES, SEEPAGE
STUDIE

GEOSCIENCES MANAGEMENT Institute, INC.
1000 NEVADA HWY STE 106
BOULDER CITY, NV 89005-1828
Phone Number: 702-294-3064
Fax Number: 702-294-3065
E-mail Address: dshettel@aol.com
WWW Page: <http://www.netproxy.com/gmiinc.html>
Contact Person: Dr. Don L. Shettel
Contact Title: Chairman
DUNS Number: 780506358
Year Established: 1991
Average Annual Gross Revenue: \$300,000
Capabilities Narrative:
CONSULTING EARTH SCIENCES, MINING, HYDROLOGY, OCEANOGRAPHY, ENVIRONMENTAL SCIENCES,
COMPUTER SCIENCES, COASTAL ZONE MANAGEMENT, POLLUTION ABATEMENT, ARCHAEOLOGY, SOILS
ENGINEERING, HISTORICAL PRESERVATIONS, NATURAL RESOURCES MANAGEMENT, GEOARCHAEOLOGY.

AMERICAN GEOLOGICAL SERVICES INC
12477 West Cedar Dr., STE 206
LAKEWOOD, CO 80228-2011
Phone Number: 303-988-1845
Fax Number: 303-986-2898
E-mail Address: ags@rmi.net
WWW Page: <http://www.amer-geo.com>
Contact Person: MARK ARNOLD
Contact Title: PRESIDENT & CEO
DUNS Number: 794683144
Year Established: 1992
Average Annual Gross Revenue: \$750,000

Accepts Visa Card?: Yes No Capabilities Narrative:

ENVIRONMENTAL IMPACT STUDIES AND ASSESSMENTS, ENVIRONMENTAL REMEDIATION, UNDERGROUND STORAGE TANK ASSESSMENTS, GEOLOGIC STUDIES, GROUND WATER, MINING, ECOLOGY AND ARCHEOLOGY, BIOLOGY, BOTANY, MINERALOGY.

ADVTECH ENVIRONMENTAL, INC
17917 Calle Los Arboles, Suite 800
ROWLAND HEIGHTS, CA 91748-2542
Phone Number: 626-913-2056
Fax Number: 626-913-2056
E-mail Address: mshiang@msn.com
Contact Person: MICHAEL E. SHIANG
Contact Title: PRINCIPAL
DUNS Number: 869388884
Year Established: 1993

Average Annual Gross Revenue: \$500,000 Capabilities Narrative:

ENVIRONMENTAL CONSULTING, PROPERTY TRANSFER ASSESSMENTS/AUDITS, RCRA/CERCLA/SARA/RI-FS/FEASIBILITY STUDIES, REMEDIAL ENGINEERING SERVICES, FACILITY CLOSURE PROGRAMS-DISTRIBUTION FACILITY, REGULATORY/COMPLIANCE SUPPORT, LITIGATION SUPPORT.

Special Equipment/materials:

REMEDIAL EQUIPMENT, SITE RESTORATION

GEOSYSTEMS ANALYSIS INC.
100 N STONE AVE
SUITE 405
TUCSON, AZ 85701-1540
Phone Number: 520-628-9330
Fax Number: 520-628-1122
E-mail Address: geosystems@geosystems.gila.net
Contact Person: MIKE MILCZAREK
Contact Title: PROGRAM DIRECTOR
DUNS Number: 932077050
Year Established: 1992

Average Annual Gross Revenue: \$600,000

Capabilities Narrative:

STATE OF THE ART HYDROGEOLOGIC SERVICES, INCLUDING: UNSATURATED AND SATURATED ZONE MONITORING SYSTEM DESIGN AND INSTALLATION; UNSAT AND SAT FLUID FLOW MODELING; FATE AND TRANSPORT OF SOIL AND GROUNDWATER CONTAMINATION, MINE LAND RECLAMATION, RESEARCH

Special Equipment/materials:

IN-HOUSE SOIL PHYSICS LAB, GROUNDWATER AND SOIL INVESTIGATION FIELD EQPT

GEO SCIENCE TECHNOLOGIES
904 MOORE AVE
ROSWELL, NM 88201-1144
Phone Number: 505-625-2327
Fax Number: 505-624-7188
E-mail Address: deborah.havenor@usa.net
Contact Person: DEBORAH HAVENOR
Contact Title: OWNER
DUNS Number: 933052912
Year Established: 1996

Average Number of Employees: 0001

Average Annual Gross Revenue: \$0

Accepts Visa Card?: Yes No

Capabilities Narrative:

HYDROGEOLOGICAL, HYDROGEOCHEMICAL, AND ISOTOPIC SERVICES, ENVIRONMENTAL INVESTIGATIONS, GEOLOGIC INVESTIGATIONS, ENVIRONMENTAL AUDITS, HYDROCARBON RESOURCE SERVICES.

Smith-Comeskey Ground Water Science LLC
203 E. Highland Ave.

Ada, OH 45810
Phone Number: 419-634-7717
E-mail Address: waterdig@wcoil.com
WWW Page: <http://www.groundwatersystems.com>
Contact Person: Stuart Smith
Contact Title: partner
Year Established: 1986
Average Annual Gross Revenue: \$90,000
Accepts Visa Card?: Yes [] No

Capabilities Narrative:
Troubleshooting and planning for rehabilitation and prevention of well and groundwater system performance and water quality problems, water supply hydrogeology, drilling and maintenance training, research, writing and editing pertaining to ground water.

Special Equipment/materials:
Biofilm collection apparatus

Alliance Environmental Services, Inc.
2173 Embassy Drive
Lancaster, PA 17603
Phone Number: 717-399-3323
Fax Number: 717-399-3966
E-mail Address: aesilanc@alliance-env.com
Contact Person: John Ward
Contact Title: Senior Project Manager
DUNS Number: 927591545
Year Established: 1995
Average Annual Gross Revenue: \$700,000

Capabilities Narrative:
environmental, assessment, compliance, restoration, sampling, groundwater, safety, training, wetlands, underground tanks, asbestos, environmental impact, OSHA, monitoring, wells, waste, air, soil, hydrogeology, water supply, audit, planning, aquifer, risk

Tom, There are a couple of others but I ran out of time. Had to go pick up my son. If you still need them, I'll send them tomorrow. Sorry.

Sharon L. Hoard
Supplier Management & Business
Affirmative Action Office (SM/BAAO)
U.C. Lawrence Livermore National Laboratory
hoard2@llnl.gov
Tel. No. (925) 422-1903

Attachment 9

**Criteria used by LLNL to Evaluate
Hydrogeological Services
Bids for Plumas County**

**Lake Davis Hydrogeologic
Reevaluation Proposal Review**

By: _____

Date: _____

1. Education of principals (MS or Ph.D. in Hydrogeology or Engineering Geology).

2. Registration of principals (Registered in State of California).

3. Experience of principals (10 yrs of experience evaluating the hydrogeology of bedrock aquifer systems with demonstrated experience in hydrogeology, hydrology, geology, rock properties, petrophysics, geochemistry, soil and water sampling, well drilling and installation, geologic well logging, data gathering and data interpretation).

4. Appropriateness of principal/staff time allotted to complete required tasks

5. Schedule of tasks/deliverables

6. Other comments or notes

Attachment 10

**Draft and Revised Study Design
and Scope of Work for PBO and
Rotenone Residue Analysis
on Fish from Lake Davis**

Fax Cover Sheet

Date: 7/30/98

Time:

Please Deliver the Following Pages...

To:

Name: Brian Finlayson

Company: CDFG

City: _____

Fax #: 916-358-2953 Voice #: _____

From:

Tina Carlsen

LLNL

Lawrence Livermore National Laboratory

Fax #: _____ Voice #: _____

Info:

You should be receiving 3 pages including this cover sheet. If you do not receive all pages or there is an error during transmission, please call.

Notes:

My comments - pretty minor. Let me know if you can't read them. question - has Fran agreed to stop pushing for VOC analysis. I agree it is very remote that VOCs would be detected in the samples AND the source would be suspect if detected, but I'm not sure I convinced Fran of this.

Tina



DEPARTMENT OF FISH AND GAME
PESTICIDE INVESTIGATIONS UNIT
FAX COVER SHEET

7.29

DATE

3

NUMBER OF PAGES, INCLUDING FAX COVER SHEET

FAX TRANSMITTED TO:

Tim Carlson

NAME

DEPARTMENT/DIVISION/OFFICE

LOCATION (Bldg.-Room)

925
(570) 423-5764

FAX TELEPHONE NUMBER

CITY

422-7103

OFFICE TELEPHONE NUMBER

FAX FROM:

Brian Finlayson

NAME

1701 Nimbus Road, Suite F

LOCATION (Bldg.-Room)

Rancho Cordova

CITY

(916) 358-2953

FAX TELEPHONE NUMBER

(916) 358-2950 or (916) 358-2951

OFFICE TELEPHONE NUMBER

ADDITIONAL INSTRUCTIONS:

1. The Scope of work will be attached to the contract between DFG and CUDLS
 2. The Study Design describes what will be analyzed.
- Any comments -

Study Design
PBO and Rotenone Residues in Fish from Lake Davis

I. Samples of bullhead, trout and bluegill collected from Lake Davis before the fish planting and samples of trout collected from Lake Davis after the fish planting will be analyzed for piperonyl butoxide (PBO) and rotenone by California Veterinarian Diagnostic Laboratory Services (CVDLS). The California Department of Fish and Game (DFG) will process the fish for analyses in one of two ways using Standard Operating Procedure B-5¹:

(1) A sample (minimum of 10 grams) of the fillet (muscle tissue minus the skin) will be submitted for analysis. The dissection will use chemically clean utensils, and the sample will be placed in a chemically clean glass jar.

(2) A sample (minimum of 10 grams) of the entire fish will be submitted for analyses. The sample will be processed using a Brienkman® Bottle 400 Mixer/Homogenizer which will be chemically cleaned after each use. The sample will be placed in a chemically clean glass jar.

II. A minimum of nine (9) fish will be collected from each of three areas in Lake Davis during the second week of August. The individual fish will be double wrapped in aluminum foil, marked with a sample identification, and placed on dry ice for transport back to the laboratory. All samples will be accompanied with a chain-of-custody form. The fish will be archived at the DFG laboratory in a freezer at -80 °F until processed for analysis. Of these nine fish, seven (7) will be analyzed for residues in fillet tissue and two (2) will be analyzed for residues in whole body. A total of twenty-seven (27) samples will be analyzed for residues of PBO and rotenone from the three following areas:

- (1) Adjacent to Big Grizzly Dam.
- (2) Adjacent to Lightning Tree Boat Ramp.
- (3) Adjacent to Big Grizzly Creek inlet at northern area.

III. The bullhead, bluegill, and trout previously collected and archived at the DFG laboratory will be processed for analysis using the procedure described in II above. Of the nineteen (19) bullhead collected to date, 15 will be analyzed for residues in fillet tissue and 4 will be analyzed for residues in whole body. The two bluegill and one trout will be analyzed for residues in fillet tissue.

IV. All samples will be processed and submitted in mass to the CVDLS by the end of August.

¹California Department of Fish and Game, Pesticide Investigations Unit, Quality Assurance Manual, Revision 2, SOP B-5, Tissue Sample Extraction for Pesticide Residue Analysis, December 31, 1996.

If this is not too long, please fax me a copy, thanks. (just for my information)

Attachment A
Scope of Work

1. The contractor (CVDLS) will provide for the analyses of up to 50 fish samples for piperonyl butoxide (PBO) using GC/MS/MS methodology and 50 fish samples for rotenone using HPLC methodology. Generally, PBO and rotenone will be analyzed from the same sample.

2. The CVDLS will provide these services from August 1, 1998 through July 30, 1999.

3. The Department of Fish and Game (DFG) will process the fish and provide samples (minimum of 5 grams) of tissues for each of the analytes (minimum of 10 grams for both analytes).

4. The CVDLS will provide an SOP for each analysis and QA/QC for each analysis in the form of precision (relative percent difference on duplicate samples) and accuracy (relative percent error on spiked samples) estimates for each batch of samples analyzed.

good - I would like a copy of both

5. The detection limits required are:

I would also like to see surrogate recoveries where appropriate, as well as method blanks

Analyte	ng/g
Piperonyl butoxide	100
Rotenone	50

analytical and QC along with a copy of the chain of custody

6. The samples will be analyzed by the CVDLS and results reported to the DFG, Lawrence Livermore Laboratory, and Department of Health Services within 4 weeks of sample submission.

7. Upon completion of the foregoing to the satisfaction of the DFG, and upon submission of invoices in triplicate bearing reference to this Interagency Agreement number, the DFG agrees to pay the CVDLS at the rate of \$35.00/analyte/sample (\$70.00/sample for the two compounds).

8. The DFG ^{intends} ~~intends~~ to implement this agreement through Brian Finlayson, the Project Manager. The Project Manager shall make all determinations and take all actions as are appropriate under this Agreement. No decisions of persons other than the Project Manager unless delegated in writing, shall be binding on the Project Manager.

9. The representative for CVDLS is Birgit Pushner.

10. The results described in 6 above are to be sent to (1) Mr. Brian Finlayson, DFG, 1701 Nimbus Road, Suite F, Rancho Cordova, CA 95670, (2) Dr. David Spath, Department of Health Services, 601 North 7th Street, Sacramento, CA 95814, and (3) Dr. Tina Carlsen, Lawrence Livermore National Laboratory, P.O. Box 808 L-544, Livermore, CA 94551.

DEPARTMENT OF FISH AND GAME
PESTICIDE INVESTIGATIONS UNIT
FAX COVER SHEET

7.31.98
DATE

6
NUMBER OF PAGES, INCLUDING FAX COVER SHEET

FAX TRANSMITTED TO:

Zina Carlson
NAME

DEPARTMENT/DIVISION/OFFICE

LOCATION (Bldg.--Room)

(510) 423-5764
FAX TELEPHONE NUMBER

CITY

OFFICE TELEPHONE NUMBER

FAX FROM:

Brian Finlayson
NAME

1701 Nimbus Road, Suite F
LOCATION (Bldg.--Room)

(916) 358-2953
FAX TELEPHONE NUMBER

Rancho Cordova
CITY

(916) 358-2950 or (916) 358-2951
OFFICE TELEPHONE NUMBER

ADDITIONAL INSTRUCTIONS:

Revised documents.

Study Design
PBO and Rotenone Residues in Fish from Lake Davis

I. Samples of bullhead, trout and bluegill collected from Lake Davis before the fish planting and samples of trout collected from Lake Davis after the fish planting will be analyzed for piperonyl butoxide (PBO) and rotenone by California Veterinarian Diagnostic Laboratory Services (CVDLS). The California Department of Fish and Game (DFG) will process the fish for analyses in one of two ways using Standard Operating Procedure B-5¹:

(1) A sample (minimum of 10 grams) of the fillet (muscle tissue minus the skin) will be submitted for analysis. The dissection will use chemically clean utensils, and the sample will be placed in a chemically clean glass jar.

(2) A sample (minimum of 10 grams) of the entire fish will be submitted for analyses. The sample will be processed using a Brienkman® Bottle 400 Mixer/Homogenizer which will be chemically cleaned after each use. The sample will be placed in a chemically clean glass jar.

II. A minimum of nine (9) fish should be collected from each of three areas in Lake Davis during the second week of August. The individual fish will be double wrapped in aluminum foil, marked with a sample identification, and placed on dry ice for transport back to the laboratory. All samples will be accompanied with a chain-of-custody form. The fish will be archived at the DFG laboratory in a freezer at -80 °F until processed for analysis. Of these nine fish, seven (7) will be analyzed for residues in fillet tissue and two (2) will be analyzed for residues in whole body. A total of twenty-seven (27) samples will be analyzed for residues of PBO and rotenone from the three following areas:

(1) Adjacent to Big Grizzly Dam.

(2) Adjacent to Lightning Tree Boat Ramp.

(3) Adjacent to Big Grizzly Creek inlet at northern area.

III. The bullhead, bluegill, and trout previously collected and archived at the DFG laboratory will be processed for analysis using the procedure described in II above. Of the nineteen (19) bullhead collected to date, 15 will be analyzed for residues in fillet tissue and 4 will be analyzed for residues in whole body. The two bluegill and one trout will be analyzed for residues in fillet tissue.

IV. All samples should be processed and submitted in mass to the CVDLS by the end of

¹California Department of Fish and Game, Pesticide Investigations Unit, Quality Assurance Manual, Revision 2, SOP B-5, Tissue Sample Extraction for Pesticide Residue Analysis, December 31, 1996.

August.

**PESTICIDE INVESTIGATIONS UNIT
QUALITY ASSURANCE MANUAL**

Revision No. 2

Date: December 31, 1996

Page 39

B-5 SOP for Tissue Sample Extraction for Pesticide Residue Analysis

1. The person performing necropsies must wear plastic or rubber gloves, a lab coat or apron and when necessary, a mask if the possibility of disease is present. Person performing necropsies must be able to identify fish and wildlife anatomy to ensure proper tissue extraction.
2. Keep all samples refrigerated until time of analysis.
3. Put down a clean sheet of aluminum foil, dull side up, on the stainless steel necropsy table to prevent contamination from previous dissections.
4. Wash glassware and any dissecting utensils as described in the SOP B-7. Rewash utensils between specimens and between tissues (if necessary).
5. Following extraction of tissue, place the tissue sample in a chemically clean (see SOP B-7) glass jar, and place a clean, square of aluminum foil over the opening of jar (or use a Teflon[®] lined lid), and seal lid tightly.
6. Label each bottle with your name, date, "P" number of sample, sample location, and contents of sample.
7. Make sure labels are on jars in plain view and written in indelible ink. Complete a Chain of Custody form (FG-1000) for each sample or sample set. The samples should be refrigerated in a secure location until transported to the WPCI. (or other laboratory) for analysis. The COC should be kept with any other maps or paperwork associated with the sample or investigation (i.e., FG-406) in a secure location. If samples cannot be transported to the laboratory within one to two hours, these should be frozen at a temperature of 0 °C.
8. Wash down the necropsy table with soap and water.
9. Place the remaining specimens in a large garbage bag and store in freezer in lock up in the warehouse until it can be disposed of properly. Make sure the specimens are correctly labeled with actual contents, date of storage, "P" number, and name of investigator.

**Attachment A
Scope of Work**

1. The contractor (CVDLS) will provide for the analyses of up to 60 fish samples for piperonyl butoxide (PBO) using GC/MS/MS methodology and 60 fish samples for rotenone using HPLC methodology. Generally, PBO and rotenone will be analyzed from the same sample.
2. The CVDLS will provide these services from August 1, 1998 through July 30, 1999.
3. The Department of Fish and Game (DFG) will process the fish and provide samples (minimum of 5 grams) of tissues for each of the analytes (minimum of 10 grams for both analytes). When duplicate analyses are requested for precision estimates, a minimum of 20 grams (10 grams for each analyte) will be submitted. The project manager will notify CVDLS one week before a batch of samples is submitted.
4. The CVDLS will provide an SOP for each analysis and QA/QC for each analysis in the form of precision (relative percent difference on duplicate samples) and accuracy (relative percent error on spiked samples) estimates for each batch of samples analyzed.
5. The detection limits required are:

<u>Analyte</u>	<u>ng/g</u>
Piperonyl butoxide	100
Rotenone	50

6. The samples will be analyzed by the CVDLS, and analytical and QC results along with a copy of the chain of custody form should be reported to the DFG, Lawrence Livermore Laboratory, and Department of Health Services within 4 weeks of sample submission. The CVDLS will inform the Project Manager if the analyses are expected to take longer than four weeks.
7. Upon completion of the foregoing to the satisfaction of the DFG, and upon submission of invoices in triplicate bearing reference to this Interagency Agreement number, the DFG agrees to pay the CVDLS at the rate of \$35.00/analyte/sample (\$70.00/sample for the two compounds).
8. The DFG intends to implement this agreement through Brian Finlayson, the Project Manager. The Project Manager shall make all determinations and take all actions as are appropriate under this Agreement. No decisions of persons other than the Project Manager unless delegated in writing, shall be binding on the Project Manager.
9. The representatives for CVDLS are Birgit Pushner and Frank Galey.

10. The results described in 6 above are to be sent to (1) Mr. Brian Finlayson, DFG, 1701 Nimbus Road, Suite F, Rancho Cordova, CA 95670, (2) Dr. David Spath, Department of Health Services, 601 North 7th Street, Sacramento, CA 95814, and (3) Dr. Tina Carlsen, Lawrence Livermore National Laboratory, P.O. Box 808 L-544, Livermore, CA 94551.

Fax Cover Sheet

Date: 7-31-98

Time:

Please Deliver the Following Pages...

To:

Name: Brian Finlayson

Company: CDFL

City: _____

Fax #: 916-358-2953 Voice #: 916-358-2950

From:

Tina Carlsen

SRD

Lawrence Livermore National Laboratory

Fax #: 925-423-5764 Voice #: 925-422-7103

Info:

You should be receiving 1 pages including this cover sheet. If you do not receive all pages or there is an error during transmission, please call.

Notes: Brian - Thanks for the SOP and revised document. I still highly recommend requiring the reporting of method blank and surrogate recovery results. In addition, you may consider defining a "batch" in Item 4 of Attachment A to be no larger than 10 samples so you are assured a 10% QC sample load. This would result in three batches for your 27 samples, and two batches for pre-plant collection. Ting

